

OCCASIONAL PAPER

NO.2

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CHANGES
IN THE OCCUPATIONAL
COMPOSITION OF THE
CANADIAN LABOUR FORCE,
1931-1961

by
NOAH M. MELTZ

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MARCH
1965

ECONOMICS AND RESEARCH BRANCH
DEPARTMENT OF LABOUR, CANADA

NOTE

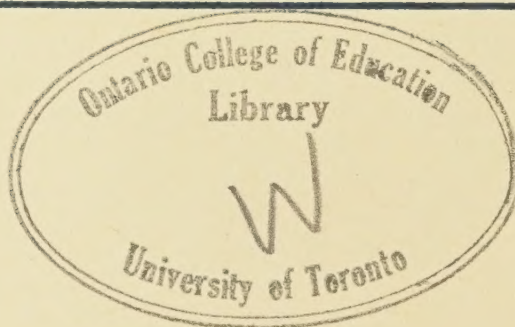
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This series of occasional papers, therefore, will contain the results of such special studies which would not otherwise be distributed as a part of the regular publication program of the Branch; the main purpose being to provide a means of bringing to the attention of research workers and others the results of studies encompassing a wide range of subjects in the manpower and industrial relations fields.

Papers in this series will be issued only as and when appropriate research work has reached the point at which publication is warranted.

The authors of these occasional papers will be exploring many aspects of their research findings. It should, therefore, be understood that responsibility for inferences and implications is assumed by the authors and should not necessarily be interpreted as a reflection of official Departmental thinking or policy.

J. P. Francis,
Director,
Economics and Research Branch.



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ROGER DUHAMEL, F.R.S.C.

Queen's Printer and Controller of Stationery

Ottawa, Canada

1965

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★ Preface ★

The basic question underlying the research in the study can be stated simply: why was there a change in the occupational composition of the Canadian labour force during the period 1931-1961? The answer to this question is not only of historical interest but also has implications for future manpower and education policies.

In this study I have undertaken an empirical analysis of the changes in the structure of the labour force defined in terms of broad occupation groups. The main sources of data are the decennial population censuses conducted in the years 1931, 1941, 1951 and 1961. Much of the data was prepared especially for this study and many of the occupation series are presented for the first time on a consistent classification basis.


I would like to mention a few of the people who helped me to prepare this study. Professor W.G. Bowen of Princeton University and Professor T.A. Finegan of Vanderbilt University supervised the research and provided advice and guidance throughout the project. In addition, I want to thank Mr. J.P. Francis, Director of the Economics and Research Branch, Canada Department of Labour, for encouraging me in this work.

The bulk of the data are derived from publications of the Dominion Bureau of Statistics. I am particularly indebted to Miss A.G. Wood, Census Division, and Mr. A. Garston, International Payments Division, for the generous assistance provided. I am also grateful to Miss Louise Woods of the Economics and Research Branch, Department of Labour, who carefully prepared most of the detailed adjustment in the data. Naturally, I bear the final responsibility for the results which emerge.

The laborious task of typing the manuscript was born with cheerful patience by my wife. Without her help in so many ways this study would never have been completed.

Finally, I would like to thank the Canadian Department of Labour and the Canada Council for the financial assistance which made this study possible.

Noah M. Meltz.



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Introduction

Plan of the Research

The objectives of the research can be summarized in three questions:

(1) What were the significant patterns of changes in occupational composition over the period 1931-1961?

(2) What economic factors were responsible for these changes?

(3) What are the implications of this analysis for techniques of projecting manpower requirements?

This is the basic framework of the study. Each question has been expanded in breadth and depth where it seemed appropriate. The result is intended to be an empirical analysis of the major economic factors which underly the changes in the occupational composition of the Canadian Labour Force.

Two general limitations to this study should be pointed out. First, the occupations are defined in very broad terms, with the labour force divided among twelve occupational groups. (See Chapter 3). The magnitude of the task of including detailed occupations was beyond the scope of this study. Secondly, the occupational data are presented in terms of persons in each occupation and not as hours worked in each occupation. This departs from the more accepted standard of measurement in labour market analysis. Unfortunately no data were available on average annual or weekly hours of work by occupation. The labour force data, however, are intended to represent annual averages and this approach is consistent with the earnings and output figures which are on an annual basis.

In spite of these limitations, it is hoped that the dissertation will make a contribution to the body of economic knowledge. Much of the statistical data were prepared especially for this study and have not been published elsewhere. Both the over-all approach

and the method evolved from the process of searching for the appropriate techniques to use in analyzing changes in occupational composition.

Organizationally, the material is presented in seven chapters. Chapter 2 outlines the framework for the analysis, both in general theoretical terms and in the form which will be followed in the research. Chapter 3 defines the occupation and industry groups which are dealt with in the research and indicates the sources of data for these groups. Chapter 4 describes the changes which occurred in occupational composition between 1931 and 1961, along with the general economic developments over the period. This sets the stage for the body of the analysis.

In Chapter 5, the changes in each occupation's proportion of the labour force are looked at in terms of shifts in demand and supply curves for labour. This is a general analysis dealing with each occupation as if there were a national market for persons to perform each type of work. Chapter 6 continues this general approach and examines the impact on labour supply curves of changes in: (1) the education level of persons in the labour force; and (2) female participation in the labour force.

Chapter 7 goes beyond the general approach and studies the impact on occupational composition of changes in three specific variables: (1) industrial distribution of total output; (2) productivity in each industry; and (3) occupational structure of the work force in each industry.

Chapter 8 concludes the research by: (1) summarizing the findings of the study; (2) presenting the implications of the research for manpower forecasting; and (3) indicating areas where further research is needed.

The Analytical Framework for the Study

The purpose of this chapter is to present the analytical framework which will be used in the study. This framework will be discussed in the light of the theory which explains the reasons for changes in occupational composition.

Organizationally, there are three sections in this chapter. The first section outlines the theory of changes in occupational composition. The second section presents the analytical framework for the study. The final section indicates the types of data which are utilized in the research.

The Theory of Changes in Occupational Composition

The term occupational composition has been defined as the percentage distribution of the labour force among occupations. There are three ways in which the percentage of the labour force held by a particular occupation could change:

(1) The number of persons in the occupation changes while the total labour force remains constant.

(2) The number of persons in the occupation remains constant but the size of the total labour force changes.

(3) There is a combination of events (1) and (2).

If each occupation is treated as a separate factor input, then the number of persons employed in an occupation⁽¹⁾ is determined by three things:

(1) the aggregate demand for the products and services of each industry

(2) the production functions of each industry⁽²⁾

(3) the relative prices of all the factor inputs.

Each of these components, in turn, represents the combination of many factors. The aggregate demand for the products of various industries in the economy depends on the demand schedules for the products (both domestic and foreign demand) and on the

relative prices of the products within the economy as compared with the delivered prices (and availability) of those from other countries

A production function is defined as the technical relationship between the inputs of various factors of production and the output of goods and services in the producing unit. In this study the producing unit will be taken to be each industry sector. The production function of each industry is determined by the state of technology and the level of knowledge prevailing in the economy.

There are three factor inputs: resources (land), capital and labour. This study is concerned with the division of labour into occupations and industries. Various subdivisions in the other factors could be designated if they were being singled out for study.

Both the amount employed of each factor and the prices of the factors are simultaneously determined. However, in our analysis, the circular process has to be broken in order to present a framework within which to analyze the impacts of changes in the various components.

A change in any one of the components will have an impact on employment in an occupation. The amount and direction of the change will depend on the network of relationships which exist. If more than one component changes, then the final impact might be to increase, decrease or leave the total number of persons in the occupation unchanged. For example, if there is an increase in the demand for the products of an industry in which occupation A forms a large proportion, and if the production function and the relative prices of all factors (including occupation A) remain unchanged, then it is likely that employment in occupation A in the industry would increase.⁽³⁾

By the same token, if the production function of the industry were altered through a technological change while relative prices of factors and aggregate demand remained the same, it might happen that fewer persons or a greater number of persons utilized in occupation A. It is not possible a priori to say what direction of change, if any, would result.

Lastly, a change in the relative price (earnings) in this occupation might lead to substitution among the various factors of production--both the other labour factors and the non-labour factors. For example, if the relative price of occupation A were reduced, then occupation A might be substituted for the other occupations. In addition, there might be a tendency to substitute occupation A for other factors of production.

This is the way in which employment in one occupation is changed. If the changes in each occupation are added, the result gives the amount of change in total employment. The ultimate change in an occupation's proportion of the total employment depends on the amount of the change in the particular occupation and the change in the total labour force. An increase in employment in occupation

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A which was accompanied by a smaller percentage increase in total employment would give an increase in occupation A's proportion of total employment. If total employment increased at a greater rate than that of occupation A, then its proportion would fall. In the final analysis the impact on occupational composition of a particular change in one of the three major components depends on the network of relationships between the components.

Framework for the Analysis

Unfortunately data are not available for all the components set out in the theoretical framework. For example, we do not know the production functions of the various industries or the demand curves for their products. Consequently, we have to use whatever data can be obtained to shed some light on the process of change in occupational composition. In addition, since there have been few studies of this subject, there is virtually no previous research to build upon.

Two types of analysis were decided upon. The first presents a general approach to the changes in occupational composition by determining whether the demand curve for each occupation shifted more or less than the supply curve and in which direction the curves shifted. The second type of analysis is more specific. The changes in occupational composition are broken down into three component variables: industrial distribution of total output; productivity of each industry; and the occupational structure of each industry.

The form of the analysis is that of comparative statics "where demand and supply are allowed to change and the new equilibrium is compared with the old".⁽⁴⁾ In each case the net changes between 1931 and 1961 will be presented first. Following this, the decade by decade changes will be introduced in order to study the path by which the overall changes developed.⁽⁵⁾

The objective of the demand-supply analysis is to determine whether a shift in the demand curve for persons to perform an occupation was the dominant factor behind the change in the occupation's proportion of the labour force; or whether the dominant factor was a shift in the supply curve. In addition, there is the question of the direction of the shift. The purpose of this type of analysis is to provide a general approach to the study of changes in occupational composition using the most basic of economic tools.

The method is quite simple. The demand and supply curves for each occupation are defined in terms of the relative earnings in each occupation and the proportion of the labour force in each occupation. Hence the analysis is conducted on a relative basis rather than in terms of dollar value of earnings or in terms of the number of persons (or hours of work) in each occupation.

Three assumptions are made:

(1) There is a national market for persons to perform each occupation.

(2) The interaction of demand and supply schedules determines the equilibrium price (earnings) and quantity (proportion of the labour force in each occupation).

(3) The impediments restricting full knowledge of market conditions, mobility, etc., are not sufficiently strong to alter the direction of the change in the equilibrium price and quantity though they may affect the actual final values.

The analysis consists of observing the direction of change in the relative earnings in an occupation and the change in the occupation's proportion of the labour force. The shifts in demand and supply curves can be determined from the combination of these changes. This is done in Chapter 5.

Chapter 6 examines some of the factors which affected the supply curves of a few selected occupations. The shift in the supply curve of professional occupations is studied in terms of the impact arising from the change in the number of years of schooling of persons in the labour force. Since lack of education can be a major factor limiting entry into professional occupations, the change in the level of education of persons available for work will certainly be of major significance for the supply curve of professional occupations. The analysis is based on observing the changes in the proportion of the labour force in professional occupations as compared with the changes in the proportion of the labour force with higher levels of schooling.

The second part of Chapter 6 is concerned with an analysis of the impact that the change in female participation in the labour force had on the supply curves of clerical and service occupations. Women outnumber men in these occupations (and only in these two occupation groups). In addition, in each decade of the period under study, the female labour force increased at a faster rate than the male labour force. Hence it seemed reasonable to examine the impact that the change in the female labour force had on the supply curves of these two occupations.

The analysis is conducted by examining the changes in the following data: earnings of females in these occupations as compared with males; the education levels of females in these occupations; changes in the female proportion of the total number of persons in these occupations, and changes in the distribution of the female labour force among different occupations.

The major limitation of the demand-supply analysis is that it is concerned only with the general forces which underly changes in occupational composition. To remedy this defect, a second type of analysis is undertaken in Chapter 7. There, the changes in occupational composition are broken down into three

ANALYTICAL FRAMEWORK

component variables which provide a basis for identifying more specifically the reasons for changes in occupational composition. The three variables are: industrial distribution of total output;⁽⁶⁾ productivity of each industry; and occupational structure of each industry.⁽⁷⁾

Each of these variables can be related to the theoretical framework given in the previous section. The industrial distribution of total output is produced by the distribution of total aggregate demand among industrial sectors and relative prices. The productivity figure for each industry and the occupational structure of each industry are both produced by changes in the production functions and/or changes in the relative prices of factor inputs. Productivity and occupational structure changes have been separated in order to provide a more detailed approach to the analysis. There are two other reasons for identifying productivity changes and occupational structure changes: (1) there has been a great deal of research on the subject of productivity trends; and (2) both these variables are generally used in projecting manpower requirements. With regard to the second point, it has been noted that the concluding chapter will discuss the implications of this study for manpower forecasting.

The three variables, when combined, give the occupational composition of the labour force. In order to measure the impact that the change in each variable had on occupational composition three assumptions are made:

- (1) Each variable can change independently
- (2) the size of the labour force is independent of the change in each variable
- (3) the stock of capital is given

The impact of each variable is measured by allowing each to change one at a time from the base year to the final year values. The results are averaged in order to obtain the most representative measure for each variable. The final values show how much of the net change in each occupation's proportion of the labour force can be attributed to the changes which occurred in each of the variables.

These findings are used to determine whether the main factor responsible for the change in occupational composition toward white-collar workers was:⁽⁸⁾

- (1) A shift in the distribution of total output away from industries with high proportions of manual and primary workers;
- (2) a change in technology and/or a change in the relative prices of labour and capital (each considered as homogenous units) which raised the level of productivity in those industries with large proportions of manual and primary occupations; or
- (3) a change in technology and/or a change in the relative earnings of occupations which resulted in the occupational structures within industries being altered in favour of white-collar workers.

Following this, the detailed data for each of the three variables are presented and examined. The reason for this is to provide a greater insight into the origins of the changes in each variable. In addition, in the case of the industrial distribution of total output relative prices for each industry sector have been estimated. This was done to determine whether the shift in the industrial distribution of output resulted from the changes in the relative prices of the products of the various industry sectors or whether there was a change in the demand schedules of persons within (and outside) the country.

This is the outline of the analyses which are conducted in this study. The concluding chapter contains a summary of the findings of the research along with the implications for manpower forecasting techniques. In the final section of this study there is a brief discussion of the areas in which further research is needed.

Data Utilized in the Study

The objective in selecting data for this study was to obtain historical statistics which would help to throw some light on the reasons for the changes in the occupational composition of the labour force. It was also necessary that all the data be on a consistent classification basis so that all the comparisons would be among like quantities. Most of the data were derived from the decennial population censuses of Canada for 1931, 1941, 1951 and 1961.⁽⁹⁾ The other major sources of statistics were the Dominion Bureau of Statistics publications: Indexes of Real Domestic Product by Industry of Origin 1935-1961; National Accounts Income and Expenditure, 1926-1961; and National Accounts Income and Expenditure 1961.⁽¹⁰⁾

The following sets of statistics were drawn from these sources:

- (1) labour force and employment in each major occupation group, by sex⁽¹¹⁾
- (2) labour force and employment in each industry
- (3) labour force industry by occupation
- (4) average earnings in each census year, by occupation, by sex⁽¹²⁾
- (5) average number of weeks worked in each census year, by occupation, by sex⁽¹³⁾
- (6) median years of schooling by occupation, by sex
- (7) real domestic product by industry or origin
- (8) gross domestic product at factor cost by industry (current dollars)

Items (1) to (6) were derived from the decennial population census. Much of the data are presented for the first time on a comparable basis. Item (7) is based on the Indexes while item (8) comes from the National Accounts.⁽¹⁴⁾

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In addition to these sources, various other publications were used to provide data. In some cases estimates had to be made where published data were not available. The appendices at the end of the study contain the details of the methods by which the data were prepared.

Census data were relied upon heavily because this provided the only complete historical record of occupations by number of persons, earnings, weeks worked and education. There are other sources of statistics on different aspects of occupations but nothing which comes remotely close to the broad scope of the census data. In addition, by using census data it was possible to adjust the statistics to a standard classification basis so that comparisons could be made over time.

The gross domestic product and real domestic product provide the link between the changes in occupational composition and general economic developments. There are a wealth of statistics available from the National Accounts on such things as the composition of expenditure, inventory changes, annual capital formation, etc., and it was originally contemplated that these additional data would be utilized in the analysis. However, as the study progressed, it was not possible to include these other statistics. The major effort was devoted to linking changes in output and expenditure patterns with changes in occupational composition. Subsequent studies can follow up this approach with more detailed analysis of the National Accounts data.

There are a few shortcomings inherent in census data which should be pointed out. The most obvious limitation stems from the fact that the census is only conducted once every ten years. Thus, although the data cover a long time-span there are only a few observations. Secondly, questions are inevitably raised as to the reliability of statistics gathered from a household survey by enumerators who only receive one week's training. A third point, which pertains specifically to the labour force is the absence of information on multiple job holding. Persons with more than one job are classified to the job in which the most time is spent. This means that in some industries the labour force will be understated and the occupational structure affected as well.

Unfortunately there are no available statistics which could be used to correct for this last defect. However, it is likely that in most industries the absence of data on the number of persons in each industry who hold full-time jobs in other industries does not affect the results of the analysis. In the case of the other limitations we can only reiterate what was said at the outset, the census provides the only complete source of historical data on occupations.

FOOTNOTES

- (1) Strictly speaking, it is the number of efficiency units or hours of work of each occupation which is determined. However, as was noted above, it is only possible to conduct the analysis in terms of the number of persons in each occupation.
- (2) Even if the production function remains unchanged, movements along the scale line would likely alter the relative amount of inputs of the various factors. This is termed the "scale effect". Initially we contemplated having scale effects as a separate component, however it was decided to include scale effects with production functions.
- (3) This is assuming that the scale line of the industry's production function were not of an unusual shape.
- (4) Alfred W. Stonier and Douglas C. Hague, A Textbook of Economic Theory, Longmans Green and Company, Toronto, 1956, p. 160.
- (5) Since the analysis is conducted in terms of comparative statics for the overall and interdecade periods, no data are presented on average annual changes over the various periods.
- (6) The output data were adjusted to try to eliminate the effects of cyclical fluctuations. The method is described in Chapter 7.
- (7) Occupational structure is defined as the percentage distribution of each industry's labour force among occupation groups.
- (8) The category white-collar workers includes: managerial; professional; clerical; and commercial and financial occupations.
- (9) The censuses were conducted on the following dates: Seventh Census, June 1, 1931; Eighth Census, June 2, 1941; Ninth Census, June 1, 1951; Tenth Census, June 1, 1961.
- (10) These studies were published by the Queens Printer, Ottawa, in the years 1963, 1962 and 1962 respectively. In later references these publications will be identified as Indexes and National Accounts.
- (11) The labour force in an occupation (industry) is defined as the number of employed persons performing the occupation (industry) plus the number of unemployed whose last job was in the occupation (industry). The concepts of occupation and industry will be dealt with in the next chapter.
- (12) Mean earnings are presented for the census years 1931, 1941 and 1961. Only median earnings could be obtained for 1951.
- (13) Mean weeks of work were obtained or estimated only for the years 1931, 1941, and 1951.
- (14) I received much assistance in the preparation of these data from several persons in the Dominion Bureau of Statistics and in the Department of Labour, Canada. I have indicated my debt to these persons in the various appendices at the end of this study.

The Occupation and Industry Groups

Definition of an Occupation

An occupation is defined in this study as a type of work a person performs. The characteristics which identify an occupation are the functions, duties and tasks involved in the job.

It is important to distinguish between the concept of an occupation and the skill, knowledge and ability a person brings to the occupation. Some occupations require a particular and specialized training and the occupation may, in fact, be defined in terms of the possession of a diploma, university degree or equivalent qualification. Other occupations have a great variation in the types of skill, knowledge and ability which can be utilized.

The Classification Basis Used in The Study

A complete population census has been conducted in Canada at decennial intervals since 1871. ⁽¹⁾ Up to and including the 1921 census, the type of work persons performed was classified on the basis of a mixture of job function and type of goods or services produced. There was no separate identification of occupation and industry. In 1931, the published tables on the work force showed persons classified both by occupation and by industry. However, many of the occupation groups were given industrial titles based on the industry in which most of the jobs in the occupation group were located. The classification basis changed with each census until in 1961 there were only two occupation groups with the same titles as industries: transportation and communication; and service.

In addition to this general evolution in the classification basis, there have also been changes in the specific occupations recorded in the census. Changes in both technology and the structure of the economy have given rise to new occupations while older occupations were disappearing or having their work functions completely

altered. In this context it should be noted that Adam Smith begins his enquiry into the nature and causes of the wealth of nations with the chapter "on the Division of Labour". The division of labour refers to "...the separation of trades and employments one from another.... This separation too, is generally carried furthest in those countries which enjoy the highest degree of industry and improvement; what is the work of one man in a rude state of society, being generally that of several in an improved one".⁽²⁾ The concepts of occupation and industry are nothing more than different aspects of the division of labour. Hence there are bound to be continual changes in what constitutes an occupation and how specific occupations are grouped together.

In order to undertake a study of changes in occupational composition, one classification system has to be selected and efforts made to try to adjust the occupation data in all other censuses to the one basis. If the data are not on a consistent basis, then the real changes in numbers of persons in an occupation can not be separated from the changes arising from different methods of classification.⁽³⁾

In this study the 1951 occupational classification is used. It would have been preferable to use the 1961 classification since there are fewer occupations with industrial titles, but an impossible amount of additional work would have been required to put all the data on the 1961 basis. In 1960, it took me four months of full-time work to adjust the 1931 and 1941 industry by occupation data to the 1951 basis. To go back now and convert the 1931, 1941 and 1951 data to the 1961 classification basis would take a prohibitive amount of time.⁽⁴⁾ Instead, the 1961 data were converted to the 1951 basis.

The Occupational Groups Used in The Study

There are generally three levels of aggregation in which occupations are presented. At the broadest levels are the major occupation groups which divide the world of work into a dozen or so functional areas. These major groups are broken down into from 50 to 300 minor groups depending on the particular classification basis. The minor groups, in turn, are made up of a number of unit groups. The classification manual for the 1951 census of Canada presented sixteen major groups, two hundred and eighty occupation classes and approximately 14,000 occupational titles.⁽⁵⁾ For the 1961 census, over 16,000 occupational titles were listed. In this study the major occupation groups are used. A few categories have been combined so that the analysis is conducted in terms of twelve occupation groups.

The occupational classification manuals prepared for the decennial censuses contain only occupation titles with no definitions

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of the occupations.⁽⁶⁾ In describing the twelve occupations which will be used in this study, we have used examples of the specific occupations contained within each group along with definitions which were adapted from the International Standard Classification of Occupations.⁽⁷⁾

The International Standard Classification of Occupations is intended "...to provide a basis for the international comparison of occupational data and to afford guidance to countries wishing to develop or improve their systems of occupational classification."⁽⁸⁾ The manual contains definitions of occupations and is "...designed with a two-fold aim in view; its general groupings are intended to facilitate the classification of statistics derived from labour force enquiries particularly population census, while the final subdivisions are calculated to meet the requirements of employment placement for a more detailed classification".⁽⁹⁾ For purposes of placement employment services in Canada and the United States use the Dictionary of Occupational Titles (second edition), prepared by the U.S. Bureau of Employment security. A third edition will soon be available. In this manual, "Job titles are brief descriptions of the work performed, including statements of 'what the worker' does', 'how he does it', 'why he does it', and usually an indication of 'the skill involved in the doing' ".⁽¹⁰⁾

The following are the twelve occupation groups used in the study:

Managerial Occupations:

This major group includes owners, managers and officials in industries other than agriculture, fishing, public and business service. Working proprietors are classified to this group.

Professional Occupations:⁽¹¹⁾

Workers in this major group conduct research and apply, in a professional capacity, scientific knowledge and methods to a variety of technological, economic, social, industrial and governmental problems, carry out technical tasks auxiliary to scientific research, development and practice, and perform religious, educational, legal, artistic and literary functions. Those classified in this major group perform tasks which usually require training in a specific scientific or other professional field, at a university, technical institute or similar establishment or which require creative ability in literature or art or talent in entertaining.⁽¹²⁾

Clerical Occupations:

Workers in this major group compile and maintain records of financial transactions and other business activities, handle cash

on behalf of an organization or its customers, record oral or written matter by shorthand writing and typing, operate various kinds of office machines and perform other clerical tasks. ⁽¹³⁾

Commercial and Financial Occupations:

This major group includes workers who are engaged in or directly associated with selling goods and services of all kinds. In addition, this category includes occupations identified with insurance, real estate and other financial areas of work. Working proprietors are not included in this major occupation group. ⁽¹⁴⁾

Some examples of commercial and financial occupations are: commercial travellers; sales clerks; service station attendants; purchasing agents and buyers; packers and wrappers; insurance agents; real estate agents and dealers, stock and bond brokers.

Manufacturing, Mechanical and Construction:

This major group includes workers engaged in or directly associated with manufacturing processes and the construction, maintenance and repair of various types of highways, structures, machines and other products. The group includes workers in the traditional craft trades.

Some examples of manufacturing, mechanical and construction occupations are: shoemakers and repairers; dressmakers, compositors and typesetters; fitters and assemblers; mechanics and repairmen; sheet metal workers, welders and flame cutters; stationary engineers; brick and stone masons; carpenters, electricians; plumbers and pipefitters; painters, decorators.

Labourers:

This major occupation group includes workers, outside of agricultural, fishing, logging or mining occupations, who perform tasks requiring primarily physical effort. For example: bottle washer--any industry; body hanger--automotive manufacturing; drain cleaner--any industry; feeder--selected industries; form stripper--construction; front-end polisher--railways; etc.

Transportation and Communication Occupations:

Workers in this major group are directly concerned with the movement and control of means of transporting passengers and freight and with the transmission of communications. ⁽¹⁵⁾

This category includes such occupations as: air pilots; baggagemen and expressmen; bus drivers; chauffeurs; taxi drivers; locomotive foremen; postmen and mail carriers; radio and television

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announcers, broadcasters, telegraph operators; telephone operators.

Service Occupations:

This major occupation group includes workers who are directly concerned with protective, personal and domestic services. Some examples of specific occupations in this group are: guards; watchmen; policemen and detectives; barbers; hairdressers; char-workers and cleaners; janitors and sextons; practical nurses, waiters and waitresses; cooks. (16).

Agricultural Occupations:

Workers in this major group work directly on or assist in agricultural activities to raise and harvest crops and to breed or care for animals. Included in this group are: farmers and stock raisers; farm managers and foremen; farm labourers; flower growers and landscape gardeners.

Logging Occupations:

This occupation group includes workers in forestry activities who cultivate and preserve forests and gather forest products. The occupation classes within this group are: logging foreman; forest rangers and timber cruisers, lumbermen (including labourers and timber cruisers, lumberman (including labourers in logging).

Fishing Occupations:

Workers in this major group work directly on or assist in fishing or related activities to catch, gather and breed fish or other forms of aquatic life. This group also includes persons engaged in hunting and trapping.

Mining Occupations:

Workers in this major group are engaged in the extraction of solids, semi-liquids, liquids and gases from the earth, and their treatment prior to direct use or further processing. Included in this group are: miners; millmen; prospectors; labourers (miner); quarriers; drillers; rock and oil wells, foremen-miner, quarries, oil wells.

The Industry Groups Used in The Study

An industry is defined as a group of establishments producing similar types of goods and/or services.

The classification basis used in the 1951 census was selected and, just as with occupations, only the major groupings were used.⁽¹⁷⁾ The industrial classification serves for the labour force data as well as the data on real domestic product and gross domestic product.

The following fourteen industry groups were included in the study:

Agriculture

Forestry

Fishing

Mining, quarrying and oil wells

Manufacturing

Construction

Electricity, gas and water

Transportation, storage and communication

Trade

Finance, insurance and real estate

Service --

Community and business

Government

Recreation

Personal

One adjustment was made in the industrial classification in order to put the labour force data on the same basis as the real domestic product: the Dominion post office was shifted from government service to transportation, storage and communication.

Since the products of most industry sectors are generally well-known, it was decided to provide definitions and examples only for the service industries. The community service sector includes such areas as education, health, religion and welfare institutions. In addition, other public service establishments are included such as art galleries, museums and public libraries.

The business service category includes accountancy, advertising, engineering and scientific services, labour organizations, and trade association, law, and other establishments primarily engaged in the provision of business services. This category was included with community service because it was not possible to separate the occupational distributions of these sectors in the years 1931 and 1961.

The main divisions within the government service sector are; Dominion; provincial; municipal and other local governments. The Dominion government refers to the regular governmental departments and boards along with the Royal Canadian Mounted Police.

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Defence services are normally included in this sector. However, in line with the decision to exclude armed forces from the occupation side, it was also necessary to exclude armed forces (officers, and other ranks) from the government labour force. The real gross domestic product originating in defence services was correspondingly excluded. It should be noted that the Dominion government category does not include the Bank of Canada, Harbour Boards, Canadian Broadcasting Corporation or government agencies engaged in manufacturing, transportation, communications and health services; all these are classified in their appropriate industry groups.

In the case of provincial governments, departments or agencies engaged in electricity supply, communication, liquor distillation, health or education services are classified in their appropriate industry groups. The same is true of municipal water supply and other services.

Recreation service includes theatres and theatrical services, along with amusement parks, auditoriums, orchestras, billiard rooms, bowling alleys, etc.

Personal service covers such areas as barbering, domestic service, hotels and lodging houses, laundries, restaurants, undertaking and other personal services.

Cross-Classification of Occupation and Industry Data

The cross-classification of occupation and industry labour force data can be viewed in two ways: (1) distribution of each occupation among different industries; or (2) distribution of each industry's labour force among different occupations. The latter distribution is used in the analysis (see Chapter 7).

Both distributions are given in this section (in percentage terms) to provide some background information. Table 1 shows the percentage distribution of the labour force, occupation group by industry group, for 1961. The concentration of certain occupations within certain industries is readily apparent. For example, two-thirds of professional workers are in the community and service sector. Sixty-three percent of commercial and financial occupations are in the trade industry. The bulk of manufacturing and construction occupations are in the industries of the same name as in the case with the primary occupations. A little over half of transportation and communication occupations are located in that industry while for service occupations the figure is a little under a half.

Only managerial occupations, clerical occupations and labourers are spread more widely among industries.

In Table 2, the percentage distribution of each industry's work force among occupations is given. In Chapter 7, this distribution is termed "occupational structure". It is not surprising

TABLE 1
LABOUR FORCE, PERCENTAGE DISTRIBUTION,
OCCUPATIONAL GROUP BY INDUSTRY GROUP, CANADA, 1961

	All Occupations	Managerial	Professional	Clerical	Commercial	Manufacturing	Construction	Labourers	Transportation	Service	Agricultural	Fishing	Logging	Mining
All Industries	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Agriculture	10	*	*	*	*	*	*	*	*	*	96	0	*	0
Forestry	2	1	*	*	*	1	1	1	1	1	*	*	90	*
Fishing	1	*	*	*	*	*	*	*	*	*	*	84	*	*
Mining	2	1	2	1	*	2	2	1	1	*	*	0	*	89
Manufacturing	24	18	12	22	20	58	38	15	4	4	*	6	8	5
Construction	8	8	1	2	*	22	20	4	1	1	*	0	*	4
Electricity, gas and water	1	1	1	2	*	1	2	3	3	*	*	0	*	*
Transportation and communication	8	5	3	11	2	2	10	56	3	3	*	0	*	1
Trade	15	42	2	20	63	7	13	13	13	3	*	1	1	*
Finance	4	6	1	15	11	*	*	*	1	2	*	0	0	0
Service														
Community and business	12	1	68	12	2	2	2	2	2	26	1	0	0	*
Government	6	6	7	13	1	3	10	3	3	10	1	*	1	*
Recreation	1	1	1	1	*	*	*	*	*	2	*	3	0	0
Personal	7	10	1	2	1	1	2	2	2	48	1	5	*	0

SOURCE: See Appendix A

* Less than .05 percent

Figures have been rounded to the nearest whole percent.

TABLE 2
LABOUR FORCE, JUNE 1961, PERCENTAGE DISTRIBUTION,
INDUSTRY BY OCCUPATION, FOR CANADA

	All Occupations	Managerial	Professional	Clerical	Commercial Financial	Manufacturing Construction	Labourers	Transportation Communication	Service	Agricultural	Fishing	Logging	Mining
All Industries	100	8	10	13	8	22	6	8	11	11	1	1	1
Agriculture	100	*	*	*	*	*	*	*	*	98	*	*	0
Forestry	100	4	1	2	*	11	4	6	4	1	0	66	*
Fishing	100	1	2	1	*	1	1	1	2	*	90	*	*
Mining	100	4	8	7	1	23	3	4	2	*	*	*	48
Manufacturing	100	6	5	12	6	54	9	5	2	*	*	*	*
Construction	100	8	2	3	0	66	15	4	1	*	*	*	1
Electricity, gas and water	100	6	10	21	2	28	11	19	3	1	*	*	*
Transportation and communication	100	5	4	18	2	4	7	56	4	*	*	*	*
Trade	100	23	2	18	34	10	5	7	2	*	*	*	*
Finance	100	13	3	52	23	1	*	1	5	*	0	0	0
Service	100	1	57	13	1	3	1	1	23	*	*	0	0
Community and business	100	8	12	29	1	13	9	4	20	2	*	*	*
Government	100	18	7	12	4	5	3	1	40	8	3	*	0
Recreation	100	11	1	4	1	4	1	2	75	1	*	*	0
Personal	100												

SOURCE: See Appendix A
* Less than .05 percent
Figures have been rounded to the nearest whole percent.

TABLE 3
CHANGES IN THE PERCENTAGE DISTRIBUTION OF THE LABOUR FORCE,
OCCUPATION GROUP BY INDUSTRY GROUP, 1931-1961

	All Occupations	Managerial	Professional	Clerical	Commercial Financial	Manufacturing Construction	Labourers	Transportation Communication	Service	Agricultural	Fishing	Logging	Mining
All Industries	0	0	0	0	0	0	0	0	0	0	0	0	0
Agriculture	-19	*	*	*	*	*	*	*	*	-4	*	*	*
Forestry	-1	*	*	*	*	*	*	*	*	*	-14	-8	*
Fishing	*	*	+1	*	*	+1	*	*	*	*	*	*	*
Mining													-9
Manufacturing	+4	+1	+5	-2	+4	-8	-8	+8	+2	*	+6	+6	+4
Construction	+1	+2	*	+1	*	-1	-7	+2	*	*	*	*	+2
Electricity, gas and water	*	*	*	+1	*	-1	*	+2	*	*	*	*	*
Transportation and communication	*	-2	+1	-4	-1	*	-2	-15	+1	*	*	*	*
Trade	+5	-9	*	+1	-2	+3	+9	+2	+2	*	*	*	*
Finance	+2	+2	*	-4	-1	*	*	*	+1	*	*	*	*
Service													
Community and business	+6	*	-11	+5	+1	+1	+1	+1	+17	*	*	*	*
Government	+3	+3	+4	+3	*	+2	+4	*	+4	*	*	*	*
Recreation	*	-1	*	*	*	*	*	*	*	*	+3	*	*
Personal	-1	+1	-1	-1	*	*	+1	*	-26	*	+4	*	*

SOURCE: See Appendix A

* Less than .05 percent

Figures have been rounded to the nearest whole percent.

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to see that in most industries certain occupations form a high proportion of the total labour force. For example, professional occupations represent over half the number of persons in community and business service. In the case of manufacturing and construction, transportation and communication, service, and the primary industries, the occupations of the same name form over half of the labour force in each of these industries. In addition, clerical workers make up over half the number of persons in the finance sector. The significance of these concentrations will be taken up in Chapter 7.

The changes in the industry by occupation distributions between 1931 and 1961 will also be presented in Chapter 7. The changes in the percentage distribution of the labour force, occupation by industry, are shown in Table 3. The most significant development was the reduction in the concentration of each occupation within a particular industry group. For example, the proportion of the professional group in community and business service went down by eleven percentage points. The offsetting increases went to manufacturing and government. However, as Table 1 showed, in spite of the long-term trend, the majority of persons in each occupation group are located in one industry.

FOOTNOTES

- (1) The occupation data in this study are derived from the decennial censuses. The reasons for selecting this source of statistics were presented in Chapter 2, above.
- (2) Adam Smith, The Wealth of Nations, The Modern Library, New York, 1937, p. 5.
- (3) The titles attached to the performance of certain types of work have changed over time in many cases. For example, in one case I ran across, a chauffeur attached to the head office of a particular company had his title changed to "special assistant to the president". The objective in census work is to classify occupations on the basis of the type of work performed regardless of the title of the job.
- (4) The earlier adjustments were made as part of a study of occupational trends I prepared for the Economics and Research Branch, Department of Labour, Canada. The data for 1931 and 1951 are included in a paper I presented to the 33rd Annual Meeting of the Canadian Political Science Association, Montreal, 1961, "Factors Determining Occupational Trends in the Canadian Economy", (mimeographed).
- (5) Dominion Bureau of Statistics, Classification of Occupations, Ninth Census of Canada, 1951, Ottawa, 1951, p. 5.

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- (6) There are also no definitions in the United States census classification manuals. See U.S. Bureau of the Census, 1960 Census of Population Alphabetical Index of Occupations and Industries (Revised Edition), U.S. Government Printing Office, Washington, D.C., 1960. It should be noted that some adjustments are required in order to compare U.S. and Canadian census data by occupations.
- (7) Prepared by the International Labour Office, Geneva, 1958.
- (8) ibid., p. 111.
- (9) ibid.
- (10) U.S. Bureau of Employment Security, Dictionary of Occupational Titles, Volume 1, second edition, U.S. Government Printing Office, Washington, D.C., 1949, p. XIII.
- (11) Includes technical occupations. The term "technical" was not added to the title of the group until the 1961 classification.
- (12) International Labour Office, op. cit., p. 27.
- (13) ibid., p. 60.
- (14) This is one of the major differences between the Canadian classification and Industrial Standard Classification of Occupations (I.S.C.O.). In I.S.C.O., working proprietors in wholesale and retail trade are classified to sales occupations. In the Canadian classification they are placed in the Managerial Group (see above).
- (15) ibid., p. 83.
- (16) Armed Forces have been excluded from this occupation group and from the labour force.
- (17) The basis for classifying industries was: Dominion Bureau of Statistics, Standard Industrial Classification Manual, Ottawa, 1948.

★ 4 ★

Changes in Occupational Composition and General Economic Developments in Canada, 1931-1961

This chapter has two objectives: (1) to describe the principal changes which occurred between 1931 and 1961 in the occupational composition of the Canadian labour force; and (2) to briefly sketch the significant economic developments in Canada during the period.

The purpose of the first topic is to pose the question: How did the occupational composition change from 1931 to 1961? The answer provides the point of departure for the subsequent analysis which takes up the question of why the changes occurred. In their absence we would have to find a new research subject or at least phrase the overall objective of the inquiry differently. However, there were some basic changes in occupational composition and these will be described in this chapter.

The second topic is designed to provide the general economic developments in Canada during the period under study.⁽¹⁾

Organizationally, the general economic developments are considered first. The principal changes in occupational composition are described in the sections of the chapter.

General Economic Conditions in the Years 1931, 1941, 1951, and 1961

Since most of the data in this study are derived from the decennial censuses, some observations are in order concerning the economic conditions in each of the census years. Unfortunately, each census was conducted at a different point on the cycle of economic fluctuations and the level of unemployment was also different in each census.

The year 1931 represented the mid-point in the economic downturn that followed the 1929 peak. Gross National Product, in constant dollar terms amounted to \$7.6 billion in 1931, almost half way between the 1929 peak of \$9.1 billion and the depression low of \$6.4 billion in 1933.

The level of unemployment in 1931 was sizeable but only two-thirds of the depression high which was reached in 1933. (See Chart 1).

The year 1941 was one of tremendous recovery as the Canadian economy began to gear for World War II. Between 1940 and 1941, Gross National Product increased by almost fifteen per cent (in constant dollar terms).

Unemployment dropped from 423,000 in 1940 to 195,000 in 1941, a decline from 9.2 to 4.4 percent of the labour force. The number and rate of unemployment continued to decline to the war-time low of 62,000 in 1944, 1.4 percent of the labour force. 1944 also was a peak year in terms of G.N.P.

There was a great surge in economic activity in 1951 induced by the outbreak of hostilities in Korea in mid-1950. In the period from mid-1950 to mid-1951, there was a sharp rise in investment in business inventories and in consumer purchasing. The result was a substantial increase in G.N.P. and the lowering of unemployment. In terms of the rate of unemployment this was the lowest point after the early postwar years.

"The advance in Gross National Product was resumed in 1961. During the previous year the trend of economic activity had eased as downward tendencies developed in several components of end-product demand. These downward pressures were largely reversed in 1961, and following a weak first quarter, the level of activity moved on a rising trend for the remainder of the year."⁽²⁾

The average annual rate of unemployment was slightly higher in 1961 than 1960. This resulted from higher unemployment rates up until July 1961. After that the upturn began to reduce the level of unemployment below that of the previous year.

In looking at the four census years, it can be seen that each one represents a different phase on the economic cycle. 1961 was the trough of a recession. In 1941 a vigorous upswing was under way, while 1951 represents a peak (at least viewed in terms of unemployment). Finally, 1931 was mid-way through a downturn⁽³⁾

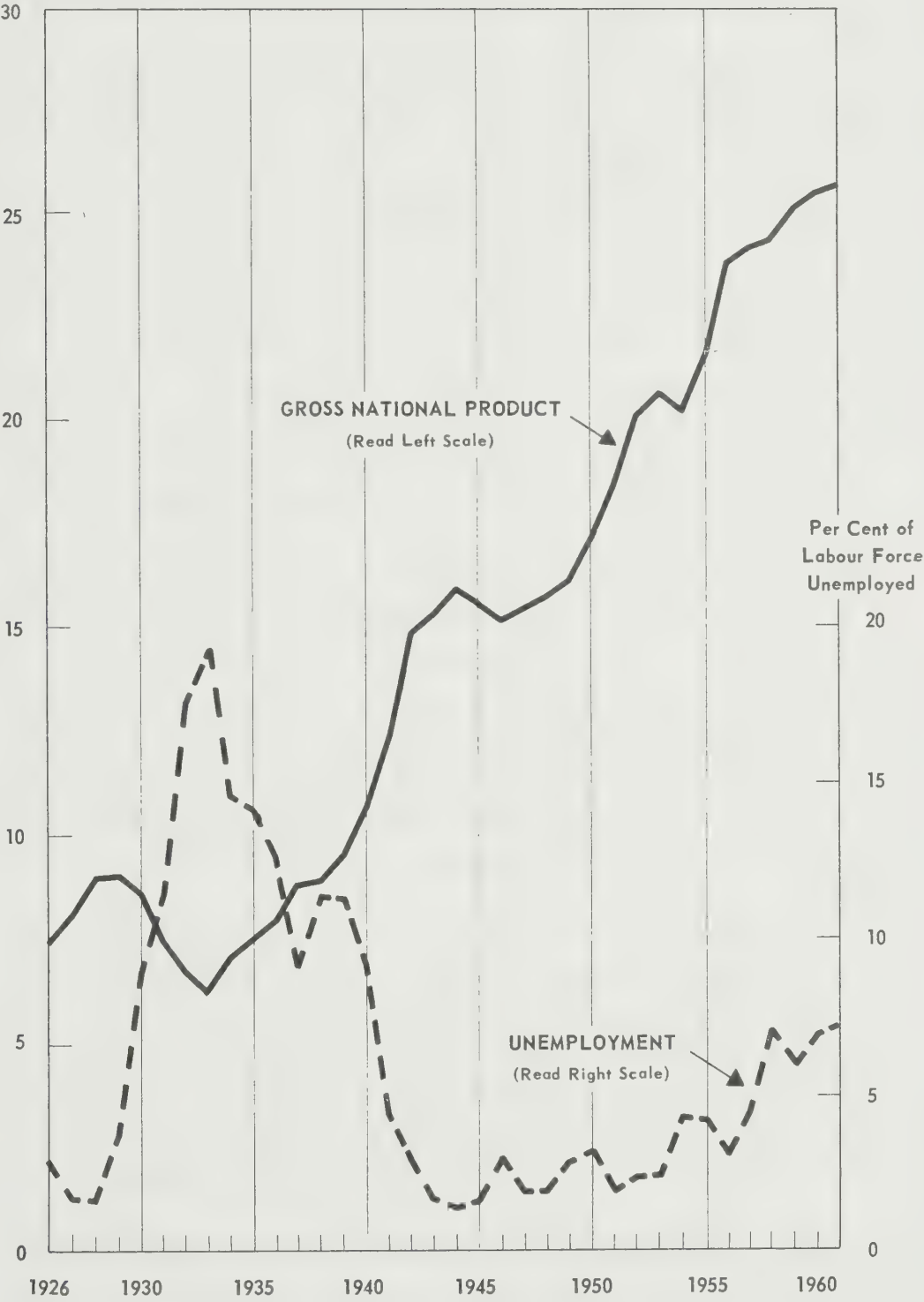
Net Changes in the Occupational Composition of the Labour Force Between 1931 and 1961

Having outlined the major economic developments during the period we now turn to the description of the significant changes in the occupational composition of the labour force.⁽⁴⁾ To begin

CHART 1

GROSS NATIONAL PRODUCT IN CONSTANT 1949 DOLLARS
AND PER CENT OF THE LABOUR FORCE UNEMPLOYED
1926 - 1961

G.N.P. in Billions
of Constant
(1949) Dollars



with, it should be noted that for purposes of analysis, two categories have been omitted from the labour force: (1) persons seeking work for the first time; and (2) persons with both occupations and industry unspecified.

This study deals with the distribution of the labour force among specified occupations. In the case of persons seeking work for the first time, there is no occupation group to which they can be classed. The same situation applies where persons specified neither an occupation nor an industry. There was no reasonable basis for distributing them among specified occupations or industries.

Persons who did not specify an occupation but did indicate an industry were prorated on the basis of that industry's distribution among occupations. This same approach was used in those cases where an occupation was reported but not an industry.⁽⁵⁾ We originally contemplated omitting the not-stated categories entirely but this would have altered the occupational composition figures especially in 1931 when 160,000 of the 442,000 labourers did not specify an industry. Only the persons who did not specify either an occupation or an industry were omitted. The redistribution of the not-stated groups accounts for the difference between the occupational data in this study and the figures contained in a report that I prepared recently for the Canadian government.⁽⁶⁾

Five significant changes in the percentage distribution of the labour force between 1931 and 1961 can be seen in Table 4.

(1) Agricultural occupations plummeted from 28.8 percent of the labour force to 10.5 percent, a drop of almost two-thirds. This was the largest change in any occupation's proportion and sent the agricultural group from first to fourth place in size.

(2) Labourers experienced the second largest decline and their proportion of the labour force was cut in half. In 1931, labourers were the third ranking occupation group, in 1961 they were ninth.

(3) Clerical workers experienced the greatest increase in proportion as they doubled their percentage of the labour force.

(4) The manufacturing and construction⁽⁷⁾ group increased by almost the same number of percentage points as clerical workers. However, relative to the 1931 figure this was only a one-third gain. In 1961 manufacturing and construction occupations had taken over from agricultural workers as the largest occupation group.

(5) Professional occupations were the other group to experience a large increase in their proportion of the labour force.

The remaining white-collar and manual occupation groups all experienced medium-sized gains in their percentage of the labour force.⁽⁸⁾ Fishing and mining workers declined relative to the labour force while logging occupations were up a fraction.

TABLE 4
NUMERICAL AND PERCENTAGE DISTRIBUTION OF THE LABOUR FORCE⁽¹⁾
BY OCCUPATION GROUP⁽²⁾ IN 1931 AND 1961;
AND NET CHANGES OVER THE PERIOD IN EACH OCCUPATION FOR CANADA⁽³⁾

	Numerical Distribution			Percentage Distribution		
	1931	1961	Net Change	1931	1961	Net Change
All Occupations ⁽¹⁾	3,917	6,211	2,294	100.0	100.0	0.0
Managerial	220	504	284	5.6	8.1	2.5
Professional	238	638	400	6.1	10.3	4.2
Clerical	261	825	564	6.7	13.3	6.6
Commercial and financial	240	495	255	6.1	8.0	1.9
Manufacturing and construction	636	1,383	747	16.2	22.3	6.1
Labourers	442	346	-96	11.3	5.6	-5.7
Transportation and communication	246	500	254	6.3	8.1	1.8
Service	360	688	328	9.2	11.1	1.9
Agriculture	1,127	650	-477	28.8	10.5	-18.3
Logging	42	80	38	1.1	1.3	0.2
Fishing	48	37	-11	1.2	0.6	-0.6
Mining	57	65	8	1.5	1.1	-0.4

(1) Excludes: (1) persons who never worked before and (2) persons with both industry and occupation not stated. The combined figures for (1) and (2) are:
1931 -- 1,000; 1961 -- 132,000. The 1931 figure may understate the never-worked.
(2) Occupation Groups have been adjusted to the 1951 classification basis.
(3) Excludes Yukon and Northwest Territories. Includes Newfoundland in 1961.
(4) Excludes labourers engaged in agricultural, fishing, logging or mining operations.

SOURCE: See Appendix A.

As a general conclusion it can be said that the white-collar occupations rose substantially as a proportion of the labour force while manual occupations increased only moderately. The primary occupations declined significantly.⁽⁹⁾

As a final note on the long-term trends, Lorenz curves were constructed to show the cumulative percentage of the labour force in major occupation groups ranked by size in 1931 and 1961, (Chart 2). From this graph, it can be seen that in 1961 the labour force was much more evenly distributed among occupations than in 1931. The curve in 1961 is flatter and lies to the right of the curve for 1931.

Decade-by-Decade Changes in Occupational Composition, 1931 to 1961

The most significant observation from the decade-by-decade changes in occupational composition presented in Table 5, is that almost all of the large net changes resulted from continuous trends over time. Thus, agricultural occupations moved steadily downward while clerical and professional occupations consistently rose. Labourers declined in the first and third decades with a pause in between. Only manufacturing and construction occupations moved differently. This group experienced substantial increases in the first two decades and the fell between 1951 and 1961.

Although the direction of change over time was the same, the size of the change in each decade varied from occupation to occupation. If the decades are taken one at a time, the following developments are observed. Between 1931 and 1941, manufacturing and construction occupations experienced by far the largest increase in proportion of the labour force (as well as in total number of persons). In fact, this was the greatest interdecade growth of any occupation group. Labourers' percentage of the labour force declined even more than manufacturing and construction occupations had risen. Agricultural workers also declined as a proportion, but by a smaller figure than labourers. It is interesting to note that in decade 1931-1941, managerial and commercial and financial occupations declined (relative to the labour force). This was the only period in which any white-collar occupation experienced a decline in its percentage of the labour force.

The pattern of changes in occupational composition in the decade 1941 to 1951 was different. White-collar occupations showed the most increase in proportion, with clerical workers and managerial occupations leading the way. Manufacturing and construction occupations made a sizeable increase and transportation and communication also grew in relative terms. The major declines went to agricultural and service occupations, with agricultural alone declining by ten percentage points.

CHART 2
CUMULATIVE PER CENT OF THE LABOUR FORCE IN
MAJOR OCCUPATION GROUPS RANKED BY SIZE,
CANADA, 1931 - 1961

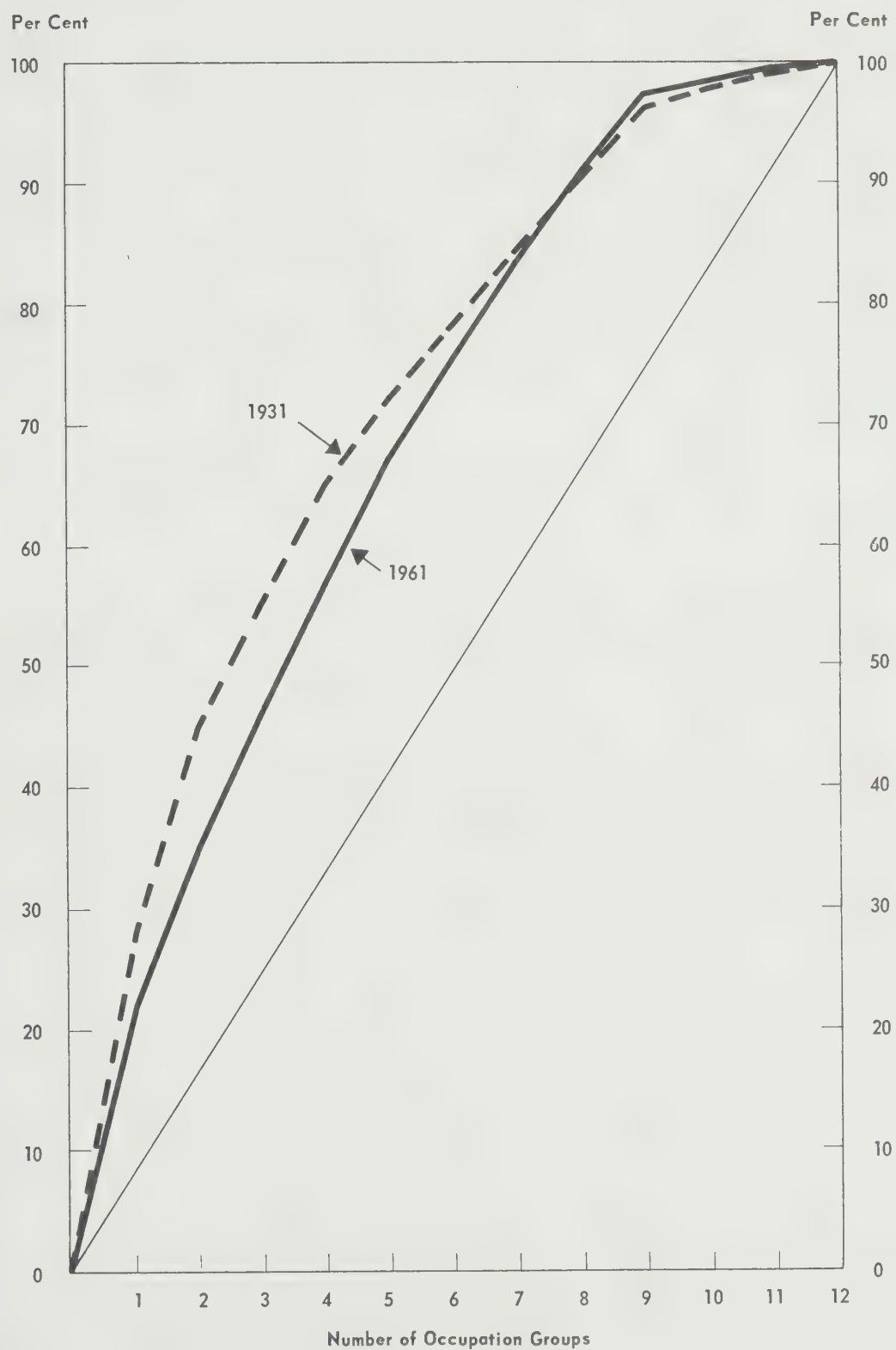


TABLE 5
INTERDECADE CHANGES IN THE NUMERICAL AND PERCENTAGE DISTRIBUTION OF THE LABOUR FORCE
BY OCCUPATION GROUP FOR CANADA, 1931-1961

	Net Change in Numerical Distribution (thousands)				Net Change in Percentage Distribution			
	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61
All Occupations	2,294	272	969	1,054	0.0	0.0	0.0	0.0
Managerial	284	6	167	111	2.5	-0.2	2.2	0.5
Professional	400	44	104	252	4.2	0.6	0.8	2.8
Clerical	564	43	260	261	6.6	0.6	3.6	2.4
Commercial and financial	255	8	102	146	1.9	-0.2	0.9	1.2
Manufacturing and construction	747	235	330	181	6.1	4.6	2.5	-1.0
Labourers	-96	-175	85	-6	-5.7	-4.9	0.4	-1.2
Transportation and communication	254	21	147	86	1.8	0.1	1.6	0.1
Service	328	80	7	241	1.9	1.3	-1.8	2.4
Agriculture	-477	-44	-253	-181	-18.3	-2.9	-9.8	-5.6
Logging	38		23	-21			0.1	-0.7
Fishing	-11		2	-16			-0.2	-0.4
Mining	8	13	-5	0	-0.4	0.2	-0.4	-0.2

SOURCE: See Appendix A.

Between 1951 and 1961 there was another re-alignment of the occupations. The white-collar occupations again moved up smartly but this time professional workers led the pack with clerical slightly behind them. Within the manual sector, only service occupations increased their percentage (and reversed their experience in the previous decade). All the primary occupations declined with agricultural workers experiencing the greatest loss, though less than their reduction in the decade earlier.

These are the significant overall and decade-by-decade changes in occupational composition. To reiterate the chief findings: (1) agricultural occupations and labourers experienced substantial losses while clerical, manufacturing and construction, and professional occupations made large gains in their percentage of the labour force; (2) in all these cases, except manufacturing and construction, the decade-by-decade changes were continuous, and (3) the size of the interdecade changes in each occupation's proportion of the labour force and the particular decade in which the largest change occurred varied from occupation to occupation.

Female Participation by Occupation

The objectives of this section are: (1) to observe the changes in the distribution of the female labour force among occupations; and (2) to examine the changes in the female proportion of different occupation groups.

The data for Table 6 were derived by using the published percentage figures for the proportion of females in each occupation group and applying these percentages to the total labour force by occupation as presented in Table 8. Thus, there are three significant points which emerge from examining the percentage distribution of the female labour force among occupations:⁽⁹⁾

(1) The bulk of the female labour force are located in a smaller number of occupations than is the case for the total of males and females. In 1961, 88.9 percent of the female labour force were in five occupations. For males and females combined, the five largest occupations contained 67.5 percent of the labour force.

(2) There has been much less change over time in the occupational composition of the female labour force. The only large change between 1931 and 1961 was the increase in the percentage of the female labour force held by clerical workers and the decline in service occupations. This change occurred mainly between 1941 and 1951. Since 1951, clerical workers have formed the largest female occupation.

TABLE 6
FEMALES IN THE LABOUR FORCE, (1) DISTRIBUTED BY OCCUPATION, CANADA, 1931 TO 1961

	A. Numerical Distribution (thousands)				B. Percentage Distribution				C. Females as a Proportion of Labour Force in Each Occupation			
	1931	1941	1951	1961	1931	1941	1951	1961	1931	1941	1951	1961
All Occupations(1)	661.5	832.3	1,153.4	1,728.3	100.0	100.0	100.0	100.0	17.0	19.8	22.3	27.8
Managerial	10.6	16.2	35.0	52.4	1.6	1.9	3.0	3.0	4.8	7.2	8.9	10.4
Professional	117.9	130.1	168.0	275.5	17.8	15.6	14.6	15.9	49.5	46.1	43.5	43.2
Clerical	117.6	152.4	319.9	507.1	17.8	18.3	27.7	29.3	45.1	50.1	56.7	61.5
Commercial and financial	55.4	72.7	123.0	181.8	8.4	8.7	10.7	10.5	23.1	29.4	35.2	36.7
Manufacturing and construction	84.6	128.9	171.8	177.0	12.8	15.5	14.9	10.2	13.3	14.8	14.3	12.8
Labourers	11.5	11.7	21.1	21.1	1.7	1.4	1.8	1.2	2.6	4.4	6.0	6.1
Transportation and communication	16.0	14.2	34.0	39.5	2.4	1.7	2.9	2.3	6.5	5.3	8.2	7.9
Service	223.7	286.3	247.9	397.3	33.8	34.4	21.5	23.0	62.2	65.1	55.5	57.8
Agriculture	23.7	19.5	32.4	76.0	3.6	2.3	2.8	4.4	2.1	1.8	3.9	11.7
Logging	--	--	--	.2	--	--	--	--	--	--	--	0.2
Fishing	.5	.3	.3	.4	.1	.3	--	--	1.0	0.6	0.5	1.1
Mining	--	--	--	--	--	--	--	--	--	--	--	--

SOURCE: The data on numbers of females in each occupation were calculated by applying the figure for the female percentage of each occupation to the adjusted figures for the total labour force in each occupation. The basis for the adjusted labour force figures is given in Appendix A.

(1) excludes women who did not report an occupation or industry and who were seeking work for the first time. Estimated total of these figures for each year are: 1931-1941 -- 700, 1951 -- 11,000, 1961 -- 32,000.

(3) There are two major differences between the patterns of change in occupational composition of the total labour force and the pattern of change in the female labour force: (a) the proportion of the female labour force in professional occupations declined slightly between 1931 and 1961, whereas there was a large increase in professionals in the total labour force; and (b) the same developments occurred in the case of service workers.

Looking at the female proportion in each occupation group (Table 6C) it can be said that, in general, the proportion of females tended to rise somewhat. In two cases there was a sharp increase and in two other cases the female proportion fell.

Females made their greatest relative gains (relative to the total number of persons in the occupation) among clerical and commercial and financial occupations. In clerical occupations, females rose from forty-five percent of the total in 1931 to sixty-two percent in 1961. For commercial and financial occupations the rise was from twenty-three to thirty-seven percent.⁽¹⁰⁾

On the other hand, the female proportion of professional and service occupations declined. Females dropped from 49.5 percent to 43.2 percent of professional workers. In the case of service occupations, the drop was from 62.2 to 57.8 percent.

In the body of the analysis, females have been singled out only in the case of clerical and service occupations. In both these groups, women outnumber men. It would be interesting to study the whole range of occupations in which females work but this task is beyond the scope of this research.⁽¹¹⁾

In summary, there are three major observations which can be made concerning the female labour force: (1) the distribution of females among occupations differs quite markedly from the distribution of the total labour force; (2) there are major differences in the patterns of change in these two distributions; and (3) although the proportion of females in the labour force has risen, the changes in the female share of the different occupations have not all been the same or even upward. In two cases (clerical and commercial and financial) there was a large increase in the female proportion, while in two other groups (professional and service) there was a decline.

FOOTNOTES

- (1) We originally intended to present the outline of the general economic developments within the theoretical framework set out at the beginning of Chapter 2. This would mean discussing: (a) the determinants of domestic and foreign demand for the products of Canadian industry, and the domestic demand for foreign products; (b) innovations and technological changes between 1931 and 1961; and (c) changes in the supplies and prices of factors of production--resources, capital and labour, as well as entrepreneurship. An adequate consideration of all these areas seemed beyond the scope of the study.
- (2) National Accounts, 1961, p. 7.
- (3) In Chapter 7, some adjustments are made in an effort to eliminate these cyclical variations.
- (4) Throughout this study it is assumed that cyclical fluctuations do not affect the total size or the occupational distribution of the labour force. See above p. 44.
- (5) The adjustments in the labour force by occupation and by industry are presented in Appendix A.
- (6) Department of Labour, Canada, Occupational Trends in Canada, 1931 to 1961, Research Program on the training of Skilled Manpower, Report No. 11, Queen's Printer, Ottawa, September, 1963.
- (7) For purposes of this study, the title of the occupation group "manufacturing, mechanical and construction" has been shortened to "manufacturing and construction".
- (8) The white-collar category includes: managerial, professional, commercial and financial occupations. The manual category refers to: manufacturing and construction, labourers, transportation and communication, and service occupations.
- (9) The percentage figures are taken from Department of Labour, op. cit., Table 3.
- (10) For the changes in the female proportion of specific occupations see: Department of Labour, op. cit., Table 6.
- (11) A discussion of some of the reasons for the decline in the proportion of women in professional occupations is contained in my Department of Labour study, *ibid.*, pp. 16-18.

★ 5 ★

Shifts in Demand and Supply Curves for Labour by Occupation

The objective of this chapter is to determine whether shifts in demand curves or shifts in supply curves were primarily responsible for changes in the occupational composition of the labour force between 1931 and 1961. This will provide a general approach to the analysis. Later chapters will be concerned with more specific economic variables.

This chapter consists of three sections. The first section presents the model on which the demand-supply analysis is based. In the second section, the analysis is carried out using changes in relative earnings in each year and changes in the occupational composition of the labour force. The final section looks at the results of the demand-supply analysis in the light of three considerations: (1) the impact of cyclical fluctuations on earnings per year; (2) the impact of the growth of unions on the supply curves of certain occupations; and (3) the fact that the model combined males and females in each occupation instead of providing a separate market for each sex.

The Demand-Supply Model

The tool of analysis which will be used to identify whether shifts in demand schedules or shifts in supply schedules had the greatest impact on an occupation's proportion of the labour force, is the simple demand and supply model. In this case, it will be assumed that there is a national market for each occupation in which price (relative earnings) and quantity (proportion of the labour force in the occupation) are simultaneously determined. It is further assumed that the demand and supply curves each have their normal shapes, that is, the demand curve slopes downward to the right and the supply curve slopes upward to the right.⁽¹⁾

Although the exact slope of each curve is not known, there is reason to believe that neither curve is horizontal or vertical. A horizontal demand curve would mean that a fractional decline in the

relative earnings in that occupation would result in an increase in demand equivalent to the entire labour force. This is unlikely. A vertical demand curve, on the other hand, implies that the proportion of the labour force demanded to perform that occupation would not change no matter what the relative earnings. It is difficult to imagine that there would be no substitution of one occupation for another at a very high relative earnings levels. Similarly, at extremely low earnings levels, there would be a strong tendency to find ways of substituting this occupation for other occupations. On the basis of these considerations, it seems likely that the demand curve will have a medium downward slope. However, it is also likely that the slopes of the demand curves will differ for each occupation. Unfortunately, the exact slope of each demand curve at each point in time can not be measured precisely.

A horizontal supply curve for an occupation means that a small increase in relative earnings will attract the entire labour force to the occupation. This does not seem very plausible since there are many reasons why persons would be reluctant to change jobs for only a slight increase in earnings. It is possible that the increase in earnings would include persons to enter the labour force in that occupation. However, this could not continue indefinitely and eventually the supply curve would begin to rise.

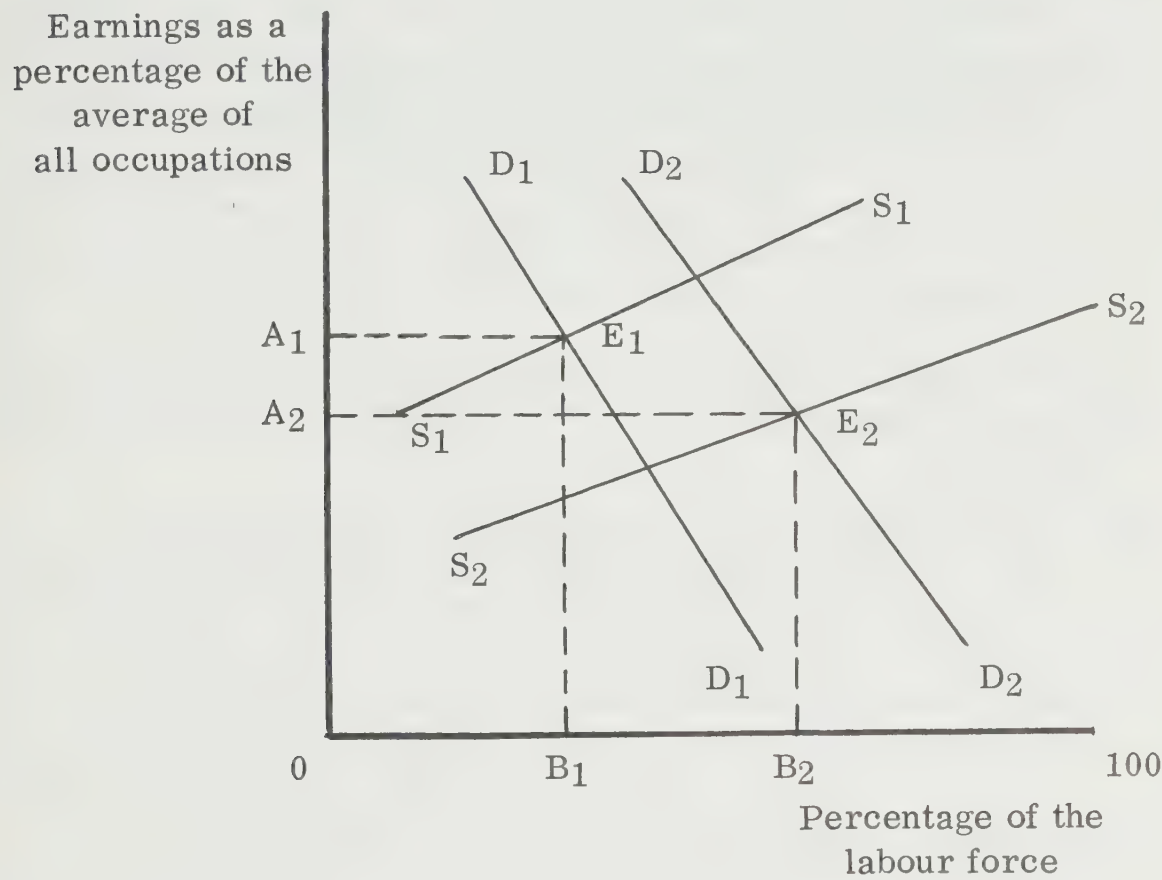
A vertical supply curve in this model means that a fixed proportion of the labour force will perform one occupation regardless of the relative earnings in the occupation (and the earnings in other occupations). It is hard to believe that at very low relative earnings levels there would not be a movement to other occupations and thereby a withdrawal of labour supplied to this occupation. By the same token, relatively high earnings would increase the supply by attracting a greater number of persons into this occupation. The actual slope of the supply curve in the upper reaches (that is, for high relative earnings) will depend on the ease with which the occupation can be entered. If all persons in the labour force are not able to perform the particular occupation (through lack of a special education or training, etc), the supply curve may become vertical at a position below full utilization of the labour force. The supply curve for most occupations will likely have a medium upward slope. However, the more specialized the occupation, the steeper will be the slope for higher relative incomes.⁽²⁾

Figure 1 shows a "typical" pair of demand and supply curves, D_1D_1 and S_1S_1 . The point of intersection is E_1 with the equilibrium relative earnings OA_1 and the equilibrium proportion of the labour force OB . Now, let both the demand curve and the supply curve shift to the right so that a new equilibrium position is established at E_2 , where the new demand curve D_2D_2 intersects the new supply curve S_2S_2 . The change in the relative earnings of the occupation and the proportion of the labour force in the occupation

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are determined by the amount of shift in each curve and by the slopes of the curves. In this case, relative earnings fell from OA_1 to OA_2 while the occupation's proportion of the labour force rose from OB_1 to OB_2 .

FIGURE 1:



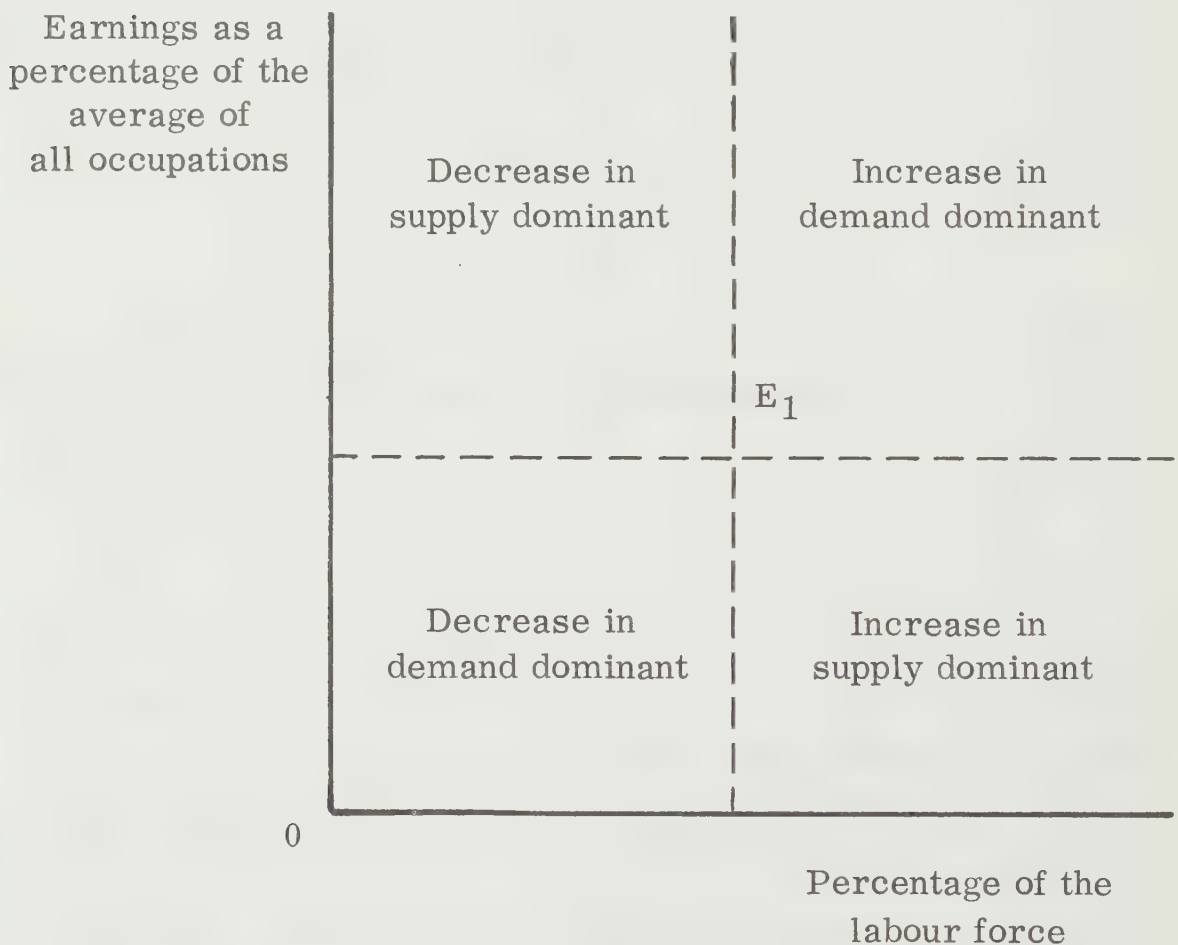
In Figure 1 the movement from E_1 to E_2 resulted from an increase in supply (a rightward shift in the supply curve) which exceeded the increase in demand (rightward shift in the demand curve). However, the same combination of a decrease in relative earnings and an increase in proportion of the labour force would also be consistent with four other possible combinations of shifts in demand and supply curves:

- (1) An increase in supply with no change in demand.
- (2) An increase in supply with a smaller decrease in demand (where the demand curve is flatter than the supply curve).
- (3) An increase in supply with an equal decrease in demand (where the demand curve is flatter than the supply curve).
- (4) An increase in supply and larger decrease in demand (where the demand curve is sufficiently flatter than the supply curve).

From this it can be seen that the movement from one equilibrium position to another depends on: the direction of the shifts in the demand and supply curves; the amount of the shifts in the curves; and the slopes of the curves. Unfortunately there is no

way we can precisely measure these factors. However, we can use the changes in relative earnings and proportion of the labour force in an occupation to determine whether a shift in the demand or supply curve was dominant and in which direction the shift took place. It was just observed that the combination of a decrease in relative earnings in an occupation and an increase in the percentage of the labour force in the occupation would result from an increase in supply and five possible changes in demand. In this situation, where the final equilibrium position is in the lower right quadrant it can be said that the increase in supply was the dominant factor. Similarly, it is possible to indicate the dominant factor in the case of the other three quadrants as is shown in Figure 2.

FIGURE 2:



When the final equilibrium position is situated on one of the boundary lines this means that the shifts in the demand and supply curves have offset each other with neither factor being dominant. If there is no change in relative earnings and an increase in proportion of the labour force, then both demand and supply have increased to the same extent. Conversely, if relative earnings are unchanged and proportion of the labour force falls, then demand and supply have both decreased the same amount. If there is an

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increase in relative earnings, then demand has increased but supply decreased to the same extent. The final possibility is a decrease in relative earnings with no change in proportion of the labour force. This would mean that demand decreased and supply increased by the same amount. These are the four possible combinations which would leave one of the factors unchanged.

Summary

The model developed in this section uses the changes in relative earnings in an occupation and the changes in the occupation's proportion of the labour force to determine: (1) whether a shift in the demand curve for persons to perform an occupation was the dominant factor; or whether the dominant factor was a shift in the supply curve; and (2) the direction of the dominant shift.

Impact on Occupational Composition of Shifts in Supply and Demand Curves, 1931-1961

The demand-supply analysis requires a knowledge of both relative earnings and occupational composition. Movements in the latter variable over the period were described in Chapter 4, but relative earnings have not yet been introduced. Accordingly, the first part of this section deals with the earnings data. Following this, the analysis of the occupational impact of shifts in demand and supply schedules will be undertaken.

For purposes of this study, the phrase "relative earnings in an occupation" is defined as the percentage figure derived by dividing average earnings in an occupation by the average earnings for all occupations. An alternative approach would be to express the earnings in each occupation as a percentage of the earnings in another occupation. Many studies of wage differentials have used the earnings of labourers as a base. However, this latter approach could produce different patterns of change over time in the earnings indices if the earnings of the base occupation followed a different pattern of change from that of the average for all occupations. It is possible for the earnings in an occupation to rise relative to the average for all occupations yet fall relative to a particular occupation. Since this study has presented the numbers of persons in each occupation in relation to total labour force, it seems consistent to view earnings in relation to the average of all occupations.

The average earnings data are based on the income wage and salary earners reported for the twelve months preceeding each census date. Wage and salary earners are one of four classes of workers identified in each decennial census. The other three classes of workers are: employers; own account; and no pay, (unpaid

family worker). Table 7 shows the number of wage earners reporting income as a percentage of the labour force in each occupation.⁽³⁾ In only three cases was the wage earner figure in 1961 below 80 percent; managerial (49), fishing (35) and agricultural (18). Since it was not possible to estimate the income of all the other classes of workers in each occupation, it was assumed that the average income of all persons in each occupation group followed the same pattern of change as the income of the wage earner portion.

A more desirable measure of earnings in each occupation would be income per hour. This could be calculated by dividing average earnings in each year by the number of hours worked in the year. Since it is likely that the number of hours worked in each occupation in a year have changed by different amounts over time, there undoubtedly will be a difference between the changes in relative earnings measured by yearly income and earnings measured by income per hour. Unfortunately, the decennial census does not record hours of work and it was not possible to prepare independent estimates.⁽⁴⁾

TABLE 7
PERCENTAGE OF THE LABOUR FORCE IN EACH
OCCUPATION REPORTING EARNINGS

	1931	1941	1951	1961
All Occupations	63	66	73	78
Managerial	29	35	41	49
Professional	66	71	77	83
Clerical	98	99	98	98
Commercial and financial	86	90	90	89
Manufacturing and construction	87	89	91	93
Labourers	96	97	97	98
Transportation and communication	91	92	91	92
Service	81	82	87	87
Agriculture	17	16	15	18
Logging	95	89	84	91
Fishing	21	16	19	35
Mining	93	94	97	96

SOURCE: 1931 Census, Volume VII, Table 50; Volume V, Table 28.

1941 Census, Volume VII, Table 18; Volume VI, Table 6.

1951 Census, Volume IV, Table 11; Volume V, Table 21.

1961 Data from Census Division, D. B. S.

All data adjusted to 1951 Census Occupation Classification

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Table 8 shows the average earnings per year in each occupation along with the relative earnings.⁽⁵⁾ There are four changes in the earnings indexes which stand out:

(1) The relative earnings of professional and managerial occupations rose between 1951 and 1961 after continuous declines from 1931 to 1951.

(2) The opposite pattern of change was experienced by manufacturing and construction occupations and labourers. In both these occupations relative earnings rose up to 1951 and then declined.

(3) The relative earnings of clerical workers and transportation and communication occupations declined in each decade.

(4) Agricultural and service occupations experienced declines in relative earnings in the first decade of the period and then rose from 1941 onward.⁽⁶⁾

These figures on relative earnings together with the occupational composition data presented earlier are juxtaposed in Table 9 to determine whether a shift in the demand curve for an occupation or a shift in the supply curve was the dominant factor over a particular period of time. Where the shift in the demand curve was the dominant change the letter "D" is inserted in the proper section. The letter "S" indicates that the shift in the supply curve was dominant. When the dominant change involved a shift to the right (an increase), no sign is attached to the letter. A negative sign indicates a shift to the left (a decrease).

Where neither the shift in the demand curve nor the shift in the supply curve was dominant, the letter "E" is entered. Those cases where there was only a change of 0.1 in the percentage distribution or 1 in the earnings index were also included in the category of shifts designated by an "E".

Over the long-term, shifts in supply curves appear to have been dominant for most occupations. Increases in supply dominated the changes in all the white-collar occupations while decreases in supply dominated the changes among agricultural workers, labourers and mining occupations. An increase in demand was the most important factor for the changes in manufacturing and construction and logging occupations.

The most interesting developments are the decade-by-decade changes. There are five significant observations which can be made:

(1) Between 1951 and 1961 increases in demand had the greatest impact on professional occupations. In the previous two decades, supply changes had been dominant. The change in the last decade is particularly interesting because at the same time there was a large increase in the stock of persons in the labour force with the education level to enter professional occupations.⁽⁷⁾

TABLE 8
WAGE EARNERS BY OCCUPATION GROUPS SHOWING AVERAGE EARNINGS DURING THE TWELVE MONTHS PRIOR TO EACH CENSUS

	Average Annual Earnings (current dollars)				Earnings in Each Occupation as a Percentage of Total Average			
	1931	1941	1951	1961	1931	1941	1951	1961
					100	100	100	100
All Occupations	847	867	1,860	3,170				
Managerial	2,843	2,421	3,491	6,438	336	279	188	203
Professional	1,426	1,293	2,329	4,443	168	149	125	140
Clerical	1,007	922	1,771	2,743	119	106	95	87
Commercial and financial	1,104	985	1,730	2,985	130	114	93	94
Manufacturing and construction	872	931	2,131	3,380	103	107	115	107
Labourers	485	597	1,516	2,142	57	69	82	68
Transportation and communication	1,041	1,009	2,065	3,343	123	116	111	105
Service	529	456	1,054	1,877	62	53	57	59
Agriculture	325	298	769	1,341	38	34	41	42
Logging	442	476	1,173	2,013	52	55	63	64
Fishing	456	407	860	1,482	54	47	46	47
Mining	782	1,116	2,399	3,970	92	129	129	125

SOURCE: 1931 Census, Volume V, Table 28.
1941 Census, Volume VI, Table 6.
1951 Census, Volume V, Table 21.
1961 Data from Census Division, D.B.S.
All Data converted to the 1951 occupation classification basis.

Mean figures for 1931, 1941 and 1961.
Median figures for 1951.

TABLE 9
RELATIVE EARNINGS, PROPORTION OF THE LABOUR FORCE, AND THE IMPACT OF DEMAND
AND SUPPLY CHANGES BY OCCUPATION GROUP

	A. Earnings in Each Occupation as a Percentage of Total Average Earnings				B. Percentage Distribution of the Labour Force				C. Factor Which Changed the Most in Each Period(1)			
	1931	1941	1951	1961	1931	1941	1951	1961	1931-61	1931-41	1941-51	1951-61
	100	100	100	100	100.0	100.0	100.0	100.0				
All Occupations	100	100	100	100	100.0	100.0	100.0	100.0				
Managerial	336	279	188	203	5.6	5.4	7.6	8.1	S	-D	S	D
Professional	168	149	125	140	6.1	6.7	7.5	10.3	S	S	S	D
Clerical	119	106	95	87	6.7	7.3	10.9	13.3	S	S	S	S
Commercial and financial	130	114	93	94	6.1	5.9	6.8	8.0	S	-D	S	E
Manufacturing and construction	103	107	115	107	16.2	20.8	23.3	22.3	D	D	D	-D
Labourers	57	67	82	68	11.3	6.4	6.8	5.6	-S	-S	D	-D
Transportation and communication	123	116	111	105	6.3	6.4	8.0	8.1	S	E	S	E
Service	62	53	57	59	9.2	10.5	8.7	11.1	S	S	-S	D
Agriculture	38	34	41	42	28.8	25.9	16.1	10.5	-S	-D	-S	E
Logging	52	55	63	64	1.1	1.9	2.0	1.3	D	D	E	E
Fishing	54	47	46	47	1.2	1.2	1.0	0.6	-D	E	E	E
Mining	92	129	129	125	1.5	1.7	1.3	1.1	-S	D	E	-D

(1) D change in demand is the dominant factor
S change in supply is the dominant factor
E Demand and Supply changed by the same amount
Minus sign indicates a decline.

(2) Increases in supply dominated the rapid and continued increase in the proportion of the labour force in clerical occupations.

(3) For manufacturing and construction occupations the dominant factor behind the changes in proportion of the labour force in each decade was demand. From 1931 to 1951, the increase in demand was the deciding factor.⁽⁸⁾ In the 1951 to 1961 decade, demand fell off.

(4) Between 1931 and 1941, when labourers suffered a huge reduction in their proportion of the labour force, supply changes were the most important element. In the subsequent decades, demand changes were dominant.

(5) In the 1941-51 decade when agricultural workers suffered their greatest relative and absolute decline, the decrease in the supply of agricultural workers was the dominant factor.⁽⁹⁾ In the previous decade, the drop in demand was the most important factor;⁽¹⁰⁾ while in the period 1951 to 1961, the declines in demand and supply were approximately equal.

The validity of the observations will now be tested by examining some of the factors which could alter the results of the demand-supply analysis.

Some Tests of the Results of the Demand-Supply Analysis

In this section, the results of the demand-supply analysis will be examined to see whether any distortion occurred as a consequence of: (1) cyclical fluctuations in the economy; (2) the growth of unions; and (3) the fact that males and females were combined in the analysis rather than assuming a separate market for each sex.

It was observed in Chapter 4 that each of the four census years was at a different point on the economic cycle. The question is, to what extent do the results of the demand-supply analysis reflect cyclical as well as secular trends? In answering this question, we will look only at the impact of cyclical fluctuations on relative earnings in each occupation. It will be assumed that cyclical changes do not affect the occupational composition of the labour force.

This assumption implies that the effect of cyclical changes is to raise or lower the number of persons in each occupation who are unemployed but that the total labour force and the labour force in each occupation remains unchanged.⁽¹¹⁾ However, if the unemployed tend to leave the labour force, then the occupational composition would be altered. In addition, heavy unemployment might draw other people into the labour force which would also change the occupational pattern. Since we are unable to measure the extent of these changes in each of the census years, it will be

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assumed that the occupational composition is not significantly affected by cyclical changes.⁽¹²⁾

Average earnings in the twelve months preceeding each census data were used in the demand-supply analysis in the preceeding section. The figures are based on the income reported by wage and salary earners regardless of the amount of time they were employed in these twelve months. Undoubtedly, an increase in unemployment would lower the average earnings in an occupation while a reduction in unemployment would raise the average. However, what further complicates our problem, is that we are interested in the changes in the relative earnings in each occupation. That is, we want to know the impact that different levels of unemployment had on the level of earnings in each occupation and on the average earnings of all occupations.

The ideal approach would be to eliminate the impact of cyclical fluctuations by estimating full-employment annual earnings in each occupation and for the labour force as a whole. Unfortunately, there did not seem to be any way to prepare such estimates. The only approach which could be taken was to estimate average earnings per week in each census year. It was felt that the number of weeks worked in each year would be affected by the level of economic activity and therefore average earnings per week would be affected by the level of economic activity and therefore average earnings per week would be more sensitive to cyclical fluctuations than annual earnings.

There are three major limitations to the use of earnings per week. In the first place we were only able to prepare this data for the years 1931, 1941 and 1951. The 1961 data are not yet available. Secondly, cyclical fluctuations might have a greater effect on the number of hours worked per week than on the number of weeks worked per year. Finally, it is possible that the number of weeks worked might be affected by factors other than cyclical fluctuations. In spite of these limitations, it was decided to calculate average earnings per week.

The method was to divide the average annual earnings in each occupation by the mean number of weeks worked during the twelve months preceding each census date.⁽¹³⁾ The number of weeks worked includes vacation and sick leave with pay. Table 10 presents three sets of data: average weekly earnings in each occupation; indexes of average weekly earnings relative to the overall average; and the mean number of weeks worked in each occupation. If relative weekly earnings are compared with relative annual earnings (Table 9) it will be seen that, for the most part, the direction of change in the index for each occupation is the same decade by decade. There are only four exceptions: manufacturing and construction, 1931-1941; agricultural, 1931-1941; fishing, 1931-1941; and mining, 1941-1951.

TABLE 10
WAGE EARNERS BY OCCUPATION GROUP SHOWING
AVERAGE WEEKLY EARNINGS DURING THE
TWELVE-MONTH PERIOD PRIOR TO EACH CENSUS

	Average Weekly Earnings (current dollars)			Earnings as a Percentage of Total Average			Mean Weeks Worked		
	1931	1941	1951	1931	1941	1951	1931	1941	1951(1)
All Occupations	20.05	21.06	42.04	100	100	100	42.23	41.16	44.24
Managerial	55.99	48.23	70.10	279	229	167	50.8	50.2	49.8
Professional	28.91	27.57	49.43	144	131	118	49.3	46.9	47.1
Clerical	21.00	20.40	38.31	105	97	91	48.0	45.2	46.2
Commercial and financial	23.76	21.79	38.96	119	103	93	46.5	43.9	44.4
Manufacturing and construction	21.65	22.56	47.03	108	107	112	40.3	41.3	45.3
Labourers	14.71	17.29	38.66	73	82	92	33.0	34.5	39.2
Transportation and communication	23.39	23.85	46.01	117	113	109	44.5	42.3	44.9
Service	11.56	11.46	25.40	58	54	60	45.8	39.8	41.5
Agriculture	7.47	8.42	20.76	37	40	49	43.5	35.4	37.1
Logging	13.16	15.31	35.59	66	73	85	33.6	31.1	33.0
Fishing	11.29	14.80	29.72	56	70	71	40.8	27.5	28.9
Mining	22.57	27.49	53.51	113	131	127	34.6	40.6	44.8

SOURCE: Same as Table 8 above.

(1) 1951 Mean weeks worked were calculated by assuming that the midpoint of each class of weeks worked represented the average figure for the total number of persons in each class.

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This would seem to indicate that, in all but four cases, the direction of the interdecade changes in annual earnings was the result of secular forces. The problem is what should be done in the case of the four exceptions. One possibility would be to revise the findings of the previous section using the direction of change in average weekly earnings. The results would be as follows: (1) Demand and supply curves for manufacturing and construction occupations would have shifted by the same amount between 1931 and 1941 instead of demand having been dominant; (2) a decline in the supply of agricultural occupations would have been dominant in the 1931-1941 decade instead of a decline in demand; (3) demand and supply for fishing occupations would still have shifted by the same amount between 1931 and 1941; (4) a decrease in the demand for mining occupations would have been dominant from 1941 to 1951 instead of the previous situation where both curves shifted by the same amount.

For our analysis, these changes are significant in the case of manufacturing and construction occupations, and agricultural occupations over the period 1931 to 1941. When the demand-supply analysis was first presented using average annual earnings data, these reservations were noted (see page 44).

In the analysis dealing with Table 9, the changes in relative earnings were assumed to result from the combined shifts in demand and supply curves for certain occupations. The question arises whether the growth of unions should also be included as an independent influence on relative earnings. In particular we want to know whether the direction of changes in relative earnings in certain occupations would have been different in the absence of unions. This is a difficult question to answer since we must determine what effect unions had on both the level of earnings in each occupation and on the average earnings of the whole labour force.

Unions would affect relative earnings by altering the supply curves of labour in certain occupations.⁽¹⁴⁾ It is likely that unions would have their greatest impact in the case of excess demand for labour. When there is excess supply, "Even in the absence of unions, managements hesitate to reduce the money wages of men already employed."⁽¹⁵⁾ On the other hand "... there are a number of good reasons for thinking that an increase in the demand for labour will increase union strength and union demands at the same time it is reducing employer resistance. And we would expect a higher wage adjustment to result from this enhancement of the relative bargaining power of the union--unless the negotiators were especially concerned with some other aspect of union-management relations, such as union security".⁽¹⁶⁾ Thus, it would appear that the direction of change in the wage adjustment is not likely to be altered by unions although the probability is raised that the magnitude will be increased. It cannot be stated for certain

what this will do to the direction of change in the relative earnings in an occupation. We can only assume that in most cases it is unlikely that unions would alter the direction of change in relative earnings.

In an effort to substantiate this view, we will briefly look at the changes in relative earnings in the period of the greatest union growth. As Table 11 shows, the largest increase in union membership occurred between 1941 and 1951. This was the period of the war and postwar prosperity. In addition, in 1944 the Canadian government enacted into legislation of Wagner Act principles of compulsory recognition and compulsory bargaining.⁽¹⁷⁾ Manufacturing, labourers, and logging occupations experienced increases in relative earnings in this period. Unions may have affected the magnitude of the gains in relative earnings but is likely that the overriding factor was the increase in demand for persons to perform these occupations.⁽¹⁹⁾ The relative earnings in transportation and communication occupations fell not only in this decade but throughout the entire period from 1931 to 1961. From these data, it seems reasonable to assume that the growth of unions did not significantly alter the direction of change in relative earnings.

TABLE 11
TOTAL UNION MEMBERSHIP IN CANADA,
1931-1961

Year	Union Membership ⁽¹⁾ (thousands)
1931	311
1941	462
1951 ⁽²⁾	1,029
1961 ⁽²⁾	1,447

SOURCE: Economics and Research Branch, Department of Labour, Canada, *Labour Organizations in Canada*, Fifty-second edition, 1963, Table I.

(1) For the years 1931 and 1941, the figures refer to December 31. For 1951 and 1961, the figures are for January 1.

(2) includes Newfoundland.

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The third point to be taken up is whether the demand-supply analysis should have been conducted separately for males and females instead of using combined data. Where females and males are substitutable (though not necessarily perfect substitutes), the labour market would have to be defined to include persons of both sexes.⁽²⁰⁾ In the case of an occupation in which only males (females) are employed it might seem reasonable to compare the earnings in the occupation with the average earnings for all males (females) and to do the same for the proportion of the labour force. However, even in the latter situation it is possible to argue that the substitution of say women for men in one occupation would affect the supply of men to the all-male occupations.

There are only three occupations in which only men or women are employed. These are the resource occupations: logging, fishing and mining, which are exclusive male preserves. Although females outnumber males in clerical and service occupations, there are still a sizeable number of men in these areas.⁽²¹⁾ If the male labour force is looked at separately for the resource occupations, the results of the demand-supply analysis, for the most part, do not change.⁽²²⁾

Conclusion

In this chapter, a model was developed to determine: (1) whether shifts in the demand curve for each occupation exceeded the shift in the supply curve for each or vice versa; and (2) the direction of the shifts. An analysis was conducted using the proportion of the labour force in each occupation and the relative earnings per year in each occupation. Several possible complicating factors were examined but it was found that with only a few exceptions these two variables could be used to determine the relative shifts in demand and supply curves for each occupation.

FOOTNOTES

- (1) The terms "demand curves" and "supply curves" will be used in relation to the model under discussion. There may be some confusion since the curves are usually defined in terms of wage rates (per hour) and units of labour (manhours). However, in this discussion we are interested in the relative earnings level and relative employment, and not the actual earnings or number employed.
- (2) For a thorough discussion of demand and supply and marked equilibrium see: A.W. Stonier and D.C. Hague, A Textbook of Economic Theory, Toronto, 1953, Chapter I.
- (3) In 1951 the question asked for total wage and salary earnings. The census in 1941 and 1931 asked for total earnings of wage earnings. The 1961 questionnaire is not available. The earnings data by occupation have been adjusted to the 1951 occupational classification. Earnings figures for the group "occupation not stated" were not included since there did not seem to be a reasonable method of distributing the earnings of persons in this group among the other occupations.
- (4) Since 1919 the Department of Labour, Canada, has conducted an annual survey of wage rates and hours of work for selected occupations. Unfortunately there are some occupation groups that are not covered by the survey. In addition, the survey uses its own occupation definitions and there are problems of adjusting the classifications to conform with the census basis. See: Economics and Research Branch, Department of Labour, Canada, Wage, Rates, Salaries and Hours of Labour; 1962, Report No. 45, Ottawa, 1963.
 In the 1951 census, occupations are shown by three groups of hours worked in the week of the census: 1-14, 15-34, 35+. (See 1951 Census, Volume V, Table 6). There are no hours data in earlier censuses.
- (5) For the years 1931, 1941 and 1961, mean earnings data are presented. Since it was not possible to calculate mean earnings for 1951, the median figures were used.
 I had some qualms about comparing mean and median figures but there did not appear to be an alternative approach. However, there are several reasons for thinking that in the context of this analysis the results would not be changed if mean earnings were available for 1951 instead of the median figures. To begin with, indexes of earnings relative to the overall average are being compared, not the raw data. Secondly we are only interested in the direction of change in the indexes, not in the amount of change. Thirdly, if the mean-median relationship in 1941 is any guide to the situation in 1951, it would appear that the direction of change would be the same in most cases whether mean or median figures were used in 1951. Appendix D shows mean and median earnings indexes for 1941 along with median indexes for 1951. It was not possible to calculate median figures for 1931 or 1961.
- (6) These observations deal only with the direction of change in the earnings indexes of each occupation. A question that has concerned economists for a long time is the trend in the structure of wage i.e., the differentials between the earnings of various occupations. The data in Table 8 could provide the basis for some interesting comments on the changes in earnings differentials between 1931 and 1961. However, since this subject is not within our frame of reference, we will resist the temptation to deal with this area.

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- (7) These developments are explored in greater depth in Chapter 6.
- (8) The use of average weekly earnings instead of average annual earnings changes the results in the manufacturing and construction occupations for the 1931 to 1941 period. On the basis of average weekly earnings demand and supply for manufacturing and construction occupations would have increased to the same extent rather than demand being dominant. In the next section the question of whether to use average weekly earnings is discussed.
- (9) In her chapter on occupational wage structure, Sylvia Ostry concluded that demand for male agricultural labourers fell more than supply over the decade 1941 to 1951. See H.D. Woods and Sylvia Ostry, Labour Policy and Labour Economics in Canada, 1962, Chapter XV, page 403. This conclusion was based on her data which show earnings of male agricultural workers declining relative to the earnings of labourers.
- Mrs. Ostry's earnings data for 1941 would seem to be inflated. After the data are adjusted, the index of the earnings of male agricultural labourers falls only a fraction in relation to the earnings of labourers. However, what is more important is that the index rises in relation to the average earnings of all occupations. I feel that the latter comparison is more valid especially since the number of agricultural workers is far greater than the number of labourers. In addition, when the earnings of males and females are taken together, the index of agricultural earnings rises in relation to both the earnings of labourers and all occupations. On this basis, I concluded that between 1941 and 1951 the decline in supply of agricultural workers was the dominant factor.
- (10) When average weekly earnings are used, the dominant factor over the period 1931 to 1941 becomes the decline in supply. See next section.
- (11) The labour force in each occupation is defined as the number of employed persons in the occupation plus the number of unemployed whose last job was in that occupation.
- (12) For a detailed study of the impact of the 1929 depression on the socio-economic distribution of the Canadian work force, see: L. C. Marsh, Canadians In and Out of Work, McGill University, Montreal, 1940.
- (13) In 1951 mean weeks worked were calculated by assuming that the mid-point of each class of weeks worked represented the mean figure for the total number of persons in the class.
- (14) It is also possible that as a result of unions the equilibrium position may be off the supply curve. This question is beyond the scope of our analysis.
- (15) W.G. Bowen, The Wage-Price Issue, Princeton University Press, Princeton, 1960, p. 102.
- (16) ibid., p. 111.
- (17) Privy Council Order 1003. In addition to these provisions, P.C. 1003 included the Canadian approach of delaying a strike or lockout through compulsory conciliation. For some points of contrast between the approach of labour legislation in the United States and Canada, see Woods and Ostry, op. cit., p. 71.

- (18) See Economics and Research Branch, Department of Labour, Canada, Labour Organizations in Canada, Fifty-second edition, Ottawa, 1963.
- (19) It will be noted that the proportion of labourers in the labour force rose between 1941 and 1951. This would appear to be the result of a demand increase rather than a supply restriction.
- (20) This analysis only deals with the major occupation groups. It is likely that within each major group the elasticity of substitution of females for males varies from occupation to occupation.
- (21) The next chapter examines the impact of changes in the supply of females on clerical and service occupations.
- (22) The one exception is the logging group in the 1931-1941 decade. The relative earnings of logging occupations rose slightly in relation to the average for males and females combined (from an index of 52 to 55) while the index remained steady (at 48) in relation to the total earnings of males. See Chapter 6, Table 17.

Some Factors Underlying Shifts in Labour Supply Curves

This chapter has two objectives: (1) to determine the impact of the rise in the education level of persons in the labour force on the supply curve of professional occupations, and (2) to determine the impact of the increase in female participation in the labour force on the supply curves of clerical and service occupations.

The level of education of persons in the labour force is an important consideration with regard to the supply curve of professional occupations since this group requires persons with the highest levels of education. Professional occupations are the only group in which the majority of persons have thirteen or more years of schooling. The proportion of the labour force with thirteen or more years of schooling made its sharpest increase between 1951 and 1961, yet in this same decade the increase in demand for professionals was the dominant factor.⁽¹⁾ These two developments seemed to warrant a closer examination.

In the case of clerical and service occupations, women outnumber men. In both these occupations, supply changes had a greater impact on relative earnings and proportion of the labour force than demand changes. Given these two things, there is a natural interest in the impact of changes in female participation in the labour force on both clerical and service occupations.

The analysis is presented in two sections. The first deals with the supply of persons to professional occupations while the second section is concerned with changes in the supply of women to clerical and service occupations.

Changes in the Supply Curve of Professional Occupations

In the previous chapter, when the general shape of supply curves was being discussed, it was indicated that where occupations required a specialized training the supply curve would tend to be

more steeply sloped. The curve would become vertical at the point where the entire proportion of the labour force that could perform the occupation were being utilized in the occupation.⁽²⁾ An increase in the proportion of the labour force with the particular specialized skill would shift the supply curve to the right. The effect of this shift on the final equilibrium position depends, of course on the direction and the amount of shift in the demand curve as well as on the slopes of the curve.

In order to measure the impact of changes in the level of education of the labour force on the supply curve to professional occupations, we would have to hold all other factors constant and be able to vary only levels of education. In addition, we would have to be able to measure both the amount of the shift in the supply curve and the change in its slope. Since this is not possible, we will try to shed some light on the relationship between levels of education and supply to the occupation by looking at: (1) the changes in the proportion of the labour force with higher levels of education, and (2) how many of the persons with higher levels of education actually went into professional occupations.

The only readily available measure of level of education is the number of years of schooling completed. Unfortunately there are a number of defects in this measure. First, in the case of the census data which will be used, the 1941 and 1951 figures pertain to the "number of years attended school" whereas the 1961 data refer to the "highest grade attended."⁽³⁾ To the extent that persons repeated grades, the number of years attended would exceed the highest grade attended. Secondly, the data for Canada in 1941 and 1951 did not distinguish between the various years of high school in different provinces. Thus, for example, in the province of Ontario, five years of high school are generally required for admission to university. In most other provinces, the figure is four years. However, in some cases, university can be entered after three years with the university term extended from four to five years.

In the 1961 census, there were separate sections in the education question for number of years of high school and number of years of university education.⁽⁴⁾ The problem was to place the 1941, 1951 and 1961 data on a consistent basis. It was decided to use years of schooling for each census year and adjust the 1961 data on a consistent basis. It was decided to use years of schooling for each census year and adjust the 1961 figures to the 1951 classification. This was done by combining persons who had some university or a university degree into the class thirteen years or more of schooling.⁽⁵⁾ There was no way in which allowance would be made for differences between number of years attained. However, it seems likely that the overall trends will not be distorted since the level of education has been rising. If there were a sign-

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ificant overstatement in the highest grade attended for the years 1941 and 1951, it would only mean that the level had been rising even faster than is recorded here.

There is a third shortcoming with the education data: no allowance is made for different types of education or differences in quality. This point will be taken up in the conclusion to this section. Table 12 shows the population not attending school by years of schooling for 1941, 1951 and 1961. Although the figures are not presented on exactly the same basis for the entire period, the overall trend clearly emerges.⁽⁶⁾ The largest change was the increase in the proportion of the population with thirteen or more years of schooling. The increase occurred in each decade but the greatest gains were made between 1951 and 1961. There was also a sizeable increase in the number of persons who had from nine to twelve years of schooling. The increase in this group appeared to be a bit larger in the 1941-1951 period than in the following decade. The proportion of the population with less than nine years of schooling declined throughout the period. In 1961 the figure dropped below fifty percent. However, it is still significant that even in 1961 almost half the population five years of age and over who were not attending school had less than nine years of formal schooling.

These same trends appear in the years of schooling of persons in the labour force as shown in Table 13. The largest overall gains were achieved by the thirteen-plus group which grew the most in the 1951-1961 decade. The nine-to-twelve group rose almost as much but the gains were made primarily in the 1941 to 1951 period. The changes in levels of education can also be measured in another way, by using median years of schooling. In Table 14, the median years of schooling are shown for the entire labour force as well as by occupation.⁽⁷⁾ It can be seen that the median years of schooling experienced a greater rise between 1951 and 1961 than from 1941 to 1951. This was to be expected since the thirteen plus category experienced its greatest growth in the former decade. It will also be noted that in 1961 the median years of schooling were 9.4 years.

In addition to the median years of schooling by occupation, Table 14 indicates the percentage of the labour force in each occupation with thirteen plus years of schooling. Professional occupations have far and away the highest level of education with a median of thirteen-plus years and sixty-six percent in the thirteen-plus category in 1961. The white-collar occupations as a whole are the only ones which have a median level of schooling above ten years. The manual group rank next in order while the primary occupations have the lowest levels of education. The only exception to this is the case of mining occupations where the level of education is slightly higher than that of labourers.

TABLE 12
POPULATION NOT ATTENDING SCHOOL, BY YEARS OF SCHOOLING, FOR CANADA, 1941, 1951 AND 1961

Years of Schooling	Population 15 Years and Over Not Attending School		Population 5 Years and Over Not Attending School	
	1941	1951(1)	1951(1)	1961(1)
Total Persons	7,807,176	9,250,886	9,818,439	11,609,314
Under Nine	4,617,577	4,975,694	5,540,153	5,723,324
Nine to Twelve	2,696,166	3,510,330	3,513,424	4,480,226
Thirteen Plus	493,433	764,862	764,862	1,405,764

Percentage Distribution		
1941	1951(1)	1961(1)
100.0	100.0	100.0
59.1	53.8	49.3
34.5	37.9	38.6
6.4	8.3	12.1

SOURCE: 1951 Census, Volume X, Chapter XI, Table XI. Comparison of 1951 and 1961 data for population five years of age and over prepared by General Population Section, Census Division, D.B.S.

(1) includes Newfoundland.

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If the earlier discussion of the decade-by-decade changes in occupational composition is recalled, it can be seen that in recent years the occupations which have shown the greatest relative gains have increasingly tended to be those occupations with more highly educated persons.⁽⁸⁾

Although most persons in professional occupations have thirteen-plus years of schooling, the majority of persons with thirteen-plus years of schooling are not in professional occupations. From Table 15, it can be seen that at least since 1941, professional occupations have held only a little more than forty percent of the total number of persons with thirteen-plus years of schooling.

TABLE 13
LABOUR FORCE BY YEARS OF SCHOOLING, FOR CANADA,
1941, 1951 AND 1961

Years of Schooling	Numerical Distribution			Percentage Distribution		
	1941	1951	1961	1941	1951	1961
Total Labour Force	4,196	5,215	6,342	100.0	100.0	100.0
Under Nine	2,463	2,644	2,594	58.1	50.7	40.9
Nine to Twelve	1,428	2,037	2,714	34.0	39.1	42.8
Thirteen Plus	306	533	1,034	7.3	10.2	16.3

What is even more significant is the fact that the proportion of the thirteen-plus total in professional occupations has been steadily declining since 1941 with a sharp reduction between 1951 and 1961. This was the period in which the proportion of the total labour force with thirteen or more years of schooling increased the most. This means that a greater proportion of the increase in the number of persons with thirteen-plus years of schooling went to non-professional occupations in the period 1951 to 1961 than did a decade earlier.

Having observed: (1) the changes in the proportion of the labour force with thirteen-plus years of schooling and (2) how many of these persons actually went into professional occupations, some comments can be made on the impact of changes in the education level of the labour force on the supply of persons to professional

TABLE 14
MEDIAN YEARS OF SCHOOLING, BY OCCUPATION GROUP AND PERCENTAGE OF EACH OCCUPATION'S LABOUR FORCE
WITH THIRTEEN OR MORE YEARS OF SCHOOLING

	Median Years of Schooling			Percentage of Labour Force in Each Occupation With 13+ Years Schooling			Change in the 13+ Percentage of Each Occupation	
	1941	1951	1961	1941	1951	1961	1941-51	1951-61
All Occupations	7.8	8.4	9.4	7.3	10.2	16.3	2.9	6.1
Managerial	9.1	9.9	10.5	12.2	18.1	27.3	5.9	9.2
Professional	12.3	13+	13+	47.5	59.3	65.9	11.8	6.6
Clerical	10.4	10.5	10.7	15.7	15.1	20.9	-0.6	5.8
Commercial and financial	9.6	9.8	10.2	9.5	11.9	17.3	2.4	5.4
Manufacturing and construction	7.7	7.8	8.2	3.4	3.6	5.9	0.2	2.3
Labourers	6.8	6.9	7.3	1.5	2.4	4.4	0.9	2.0
Transportation and communication	7.6	8.1	8.6	3.1	3.5	6.2	0.4	2.7
Service	7.6	7.8	8.2	3.1	3.8	6.4	0.7	2.6
Agriculture	6.6	6.9	7.2	1.3	1.9	3.3	0.6	1.4
Logging	5.2	5.8	6.2	0.8	1.6	3.1	0.8	1.5
Fishing	5.9	6.2	6.5	0.6	0.8	1.9	0.2	1.1
Mining	6.8	7.1	7.6	2.5	3.1	5.1	0.6	2.0

SOURCE: 1941 Census, Volume VI, Table 5.
1951 Census, Volume IV, Table 11.
1961 Data from Census Division, D.B.S.
All data were converted to the 1951 Occupation Classification Basis.

TABLE 15
PERCENTAGE DISTRIBUTION⁽¹⁾ BY OCCUPATION GROUP OF
THE NUMBER OF PERSONS IN THE LABOUR FORCE WITH
THIRTEEN OR MORE YEARS OF SCHOOLING, 1941-1961

	1941	1951	1961
All Occupations	100.0	100.0	100.0
Managerial	9.0	13.3	13.2
Professional	43.8	42.9	40.4
Clerical	15.5	16.0	16.6
Commercial and financial	7.7	7.8	8.3
Manufacturing and construction	9.8	8.0	7.9
Labourers	1.3	1.6	1.5
Transportation and communication	2.7	2.7	3.0
Service	4.5	3.1	4.2
Agriculture	4.6	2.9	2.1
Logging	.2	.3	.2
Fishing	.1	.1	.1
Mining	.6	.4	.3

SOURCE: Same as Table 14 above.

(1) excludes percentages in the occupation group not stated. These figures are: 1941 -- .4; 1951 -- .9; 1961 -- 2.2. There did not seem to be reasonable basis for allocating this group among other occupations.

occupations. We know that in each of the two decades, between 1931 and 1951, the increase in the supply to professional occupations was the dominant factor. It would appear that the increase in the proportion of the labour force with thirteen-plus years of schooling was more than sufficient to satisfy the increased demand for professional personnel up to 1951.

In the decade 1951 to 1961, demand for professionals increased more than supply. At first glance this might seem to be a paradox since there was such a tremendous increase in the number of persons with thirteen-plus years of schooling. However, closer inspection reveals two significant developments. The first is that

the demand for professionals was dominant. Between 1941 and 1951, the proportion of the labour force in professional occupations increased by 0.8 percentage points while the proportion of the labour force with thirteen years of schooling rose by 2.9 percentage points. In the next decade the professional proportion of the labour force rose by 2.8 points while the thirteen-plus proportion increased by 6.1 percentage points. Thus, in the 1941-1951 decade the rise in the thirteen-plus proportion was three and one-half times the increase in the professional figure whereas a decade later the thirteen-plus proportion rose only twice as much as the professional group. This would seem to indicate a very substantial increase in demand for professionals relative to the increase in the proportion of the labour force with the education level necessary to perform professional occupations.

In addition to the rapid rise in demand for professionals and therefore an increase in the demand for persons with thirteen plus years of schooling, there was also another source of demand for persons with thirteen-plus years of schooling. This latter demand appears to have come from all non-professional occupations. This would seem to follow from the fact that even though relative earnings in professional occupations rose, a smaller proportion of the increase in persons with thirteen-plus years of schooling went to professional occupations. A large part of the increase in the number of persons with thirteen-plus years of schooling resulted in a significant rise in the percentage of the labour force in each occupation with thirteen-plus years of schooling (see Table 14). The largest such increase occurred in managerial occupations followed by clerical and commercial and financial. There was also a significant rise in the thirteen-plus proportion of professional occupations. Except for professional occupations, the increase in the thirteen plus proportion of each occupation was larger in the 1951-1961 decade than in the previous period. Thus, for all occupations except professionals, the increase in the number of persons in the occupations with thirteen-plus years of schooling had a greater effect on the level of education in the occupation between 1951 and 1961 than a decade earlier. For professional occupations, more of the increase in persons with thirteen-plus years of schooling went simply to increase the number of persons in the occupation rather than to raise the education level.

The impact of the rise in the education level of persons in the labour force on the supply curve of professional occupations can be summed up as follows. In the decade 1941 to 1951, the increase in the proportion of persons in the labour force with thirteen plus years of schooling was more than sufficient to satisfy the increased demand for professionals. In the process, there was a significant increase in the level of education of persons in professional occupations. Although more than half the increase in the number of

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persons with thirteen-plus years of schooling went to non-professional occupations, there was little increase in the level of education (as measured by median years of schooling) in these occupations.

The situation changed in the period 1951 to 1961. In spite of the large increase in the number of persons with thirteen-plus years of schooling, demand for persons with higher education appears to have increased more than supply. The large increase in the number of professionals was one strong source of demand. In addition, the demand appears to have increased even more from the non-professional occupations, especially managerial and clerical occupations. Every non-professional occupation experienced an upsurge in their thirteen plus proportion. In the process, professional occupations netted a smaller percentage of the increase in the thirteen plus group than in the previous decade. Thus, although the increase in the level of education of persons in the labour force shifted the supply curve to professional occupations, the demand for professionals and the demand for non-professionals with higher levels of education appears to have risen even faster.

There is one significant caveat to this analysis: the category thirteen-plus years of schooling may not be sufficiently precise for the conclusions that have been drawn. For example, the thirteen-plus grouping would include graduates of a variety of universities and other post-high school institutions all of whom would not be eligible to compete for professional jobs. In addition, if most of the professional occupations require specialized training, then an increase in graduates with arts degrees would not affect the supply to specialized occupations. This is certainly one area which requires much more study in depth.

In the case of Canada, no discussion of changes in the supply curve of professional occupations is complete without some reference to the role of immigration and emigration. Accordingly, this subject will be the final note on professional occupations.

Between 1951 and 1961, there was a net increase of 250,000 persons in professional occupations. During this same period, 84,000 immigrants indicated that they intended to work in professional occupations. On the other hand, 45,000 persons in professional occupations migrated to the United States between 1951 and 1961. The net immigration of professionals in the decade amounted to 39,000 persons.⁽⁹⁾

The Impact of the Change in Female Participation in the Labour Force on the Supply Curves of Clerical and Service Occupations

Clerical and service occupations are the only two occupation groups in which females outnumber males.⁽¹⁰⁾ In addition,

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the two groups comprise more than half the female labour force. Over the period 1931 to 1961, both clerical and service occupations increased as a proportion of the total labour force and for both occupations supply changes were dominant. These developments prompted the three questions which will be dealt with in this section:

(1) To what extent were the increases in the numbers of persons in clerical and service occupations made by females?

(2) How did the numbers of females who went into these occupations compare with the increases in the female labour force as a whole?

(3) Why were females attracted to these occupations as opposed to other areas?

In the demand-supply analysis which was conducted in the previous chapter, it was found that increases in the supply of persons to clerical occupations were dominant both overall and decade by decade. Table 16 shows that females formed the largest part of the increase in supply in each decade. In fact, the difference between the number of females added to clerical occupations and the number of males steadily widened.

For service occupations, the increase in supply of persons was the dominant factor between 1931 and 1961. The same is true in the first decade, but in the middle period, 1941 to 1951, there was a decline in supply which had the greatest impact on the occupation. It can be seen from Table 16 that females contributed the largest

TABLE 16
CHANGE IN NUMBER OF PERSONS IN
CLERICAL AND SERVICE OCCUPATIONS,
BY SEX, 1931 TO 1961
(thousands)

	Clerical			Service		
	Total	Male	Female	Total	Male	Female
1931-1961	564	175	389	328	155	173
1931-1941	43	9	34	80	18	62
1941-1951	260	92	168	7	45	-38
1951-1961	261	74	187	241	92	149

SOURCE: See above, Chapter 4, Tables 5 and 6.

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number to the overall increase of persons in service occupations. The drop in supply to this occupation between 1941 and 1951 apparently came from a decrease in the number of women in service occupations. In the following decade, the supply of females again increased.

The women who entered clerical and service occupations represented over half the net additions to the female labour force between 1931 and 1961.

The relative proportion of clerical and service workers changed significantly between 1941 and 1951. The proportion of the labour force in service occupations dropped while there was an almost equal increase in clerical occupations. This change between 1941 and 1951 resulted from a reduction in the number of females in service occupations while there was a steady growth in the proportion of women in clerical occupations.

Why was such a large proportion of the increase in the female labour force attracted to clerical occupations and why was there a sudden interruption between 1941 and 1951 in the supply of women to service occupations? The reasons for the large increase in females in clerical occupations will be dealt with first.

Reasons for Large Increase in Demand for Females to Perform Clerical Occupations

There was an increase of well over half a million persons in clerical occupations between 1931 and 1961. Two factors favoured the increase in female clerical workers rather than male clerical workers. One factor is the nature of the work. Most clerical jobs are easily learned and require only a few years of high school education and/or training from a secretarial school. The work itself is largely routine and can be performed either by men or women. The second factor is the difference in the rates of pay for men and women in clerical jobs. As can be seen from Table 17, female clerical workers consistently receive much lower average annual earnings. Since females are highly substitutable for males in clerical work, and since the earnings scales are much lower for females, it was to be expected that the demand for clerical workers would be directed more towards females.

With the shift in demand away from male clerical workers, it would be expected that the relative earnings of male clerical would fall and those of female clerical workers would rise, thus narrowing the differential between male and female earnings in clerical occupations. Table 18 shows that the earnings of males in clerical occupations declined relative to the overall male average. However, female earnings in clerical occupations did not rise relative to male earnings. As Table 17C indicates, the average annual earnings of females as a percentage of male earnings were

TABLE 17
WAGE EARNERS BY OCCUPATION GROUP, MALE AND FEMALE, SHOWING AVERAGE⁽¹⁾ EARNINGS
DURING THE TWELVE-MONTHS PRIOR TO THE CENSUS DATE

	A. Average Earnings - Males (current dollars)				B. Average Earnings - Females (current dollars)				C. Female Earnings as a Percent of Male Earnings			
	1931	1941	1951 ⁽²⁾	1961	1931	1941	1951 ⁽²⁾	1961	1931	1941	1951	1961
All Occupations	925	993	2,131	3,660	559	490	1,220	1,993	60	49	57	54
Managerial	2,903	2,508	3,604	6,721	1,083	861	1,756	3,104	37	34	49	46
Professional	1,978	1,746	3,011	5,507	853	746	1,620	3,007	43	43	54	55
Clerical	1,153	1,113	2,166	3,381	830	731	1,546	2,339	72	66	71	69
Commercial and financial	1,294	1,215	2,281	3,891	536	468	1,014	1,443	41	39	44	37
Manufacturing and construction	936	1,013	2,260	3,614	468	481	1,264	1,813	50	47	56	50
Labourers	488	607	1,555	2,186	375	389	1,076	1,449	77	64	69	66
Transportation and communication	1,067	1,030	2,135	3,451	704	653	1,353	2,160	66	63	63	63
Service	897	844	1,800	2,797	301	233	644	1,153	34	28	36	41
Agriculture	326	300	788	1,400	235	185	(4)	606	72	62	(4)	43
Logging	442	476	1,173	2,014	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Fishing	457	409	860	1,498	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Mining	782	1,116	2,399	3,971	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)

SOURCE: See Table 8; Chapter 5.

- (1) Mean annual earnings except in 1951 where median figures are used.
- (2) Median annual earnings.
- (3) Earnings figures are omitted since there were less than 500 persons reporting income.
- (4) Less than \$500.

TABLE 18
MALE AND FEMALE WAGE EARNERS BY OCCUPATION, SHOWING AVERAGE EARNINGS
IN EACH OCCUPATION AS A PERCENT OF THE AVERAGE FOR ALL OCCUPATIONS

	Males				Females			
	1931	1941	1951 ⁽¹⁾	1961	1931	1941	1951 ⁽¹⁾	1961
	100	100	100	100	100	100	100	100
All Occupations								
Managerial	314	253	169	184	194	176	144	156
Professional	214	176	141	150	153	152	133	151
Clerical	125	112	102	92	148	149	127	117
Commercial and financial	129	122	107	106	96	96	83	72
Manufacturing and construction	101	102	106	99	84	98	104	91
Labourers	53	61	73	60	67	79	88	73
Transportation and communication	115	104	100	94	126	133	111	108
Service	97	85	84	76	54	48	53	58
Agriculture	35	30	37	38	42	38	(2)	30
Logging	48	48	55	55	(3)	(3)	(3)	(3)
Fishing	49	41	40	41	(3)	(3)	(3)	(3)
Mining	85	112	113	108	(3)	(3)	(3)	(3)

(1) Based on median figures.

(2) Figure is not available.

(3) Figures have been omitted since there are less than 500 women in this occupation.

SOURCE: See Table 8, Chapter 5.

actually lower in 1961 than 1931. There was some rise in this percentage during the decade 1941 to 1951, but it was followed by a decline in the next period. Moreover, the rise in the earnings of females as a percentage of male earnings seems to have affected all occupations in the decade 1941 to 1951. Therefore, it is likely that the narrowing of the gap between male and female clerical workers in this decade was primarily due to general economic developments.

The large increase in supply of women to clerical occupations seems to account for the fact that the earnings of females in clerical occupations did not rise relative to males.

Reasons Why Women Were Attracted to Clerical Occupations

Up to 1951, the relative earnings of females in clerical occupations were only a shade below the earnings of women in professional occupations, the second highest level. At the same time, the education requirements in clerical occupations were much lower than for professionals. The median years of schooling for females in clerical occupations were 10.6 in 1951 as compared with 12.4 years for professional occupations. (See Table 19.) When these two factors were coupled with the tremendous increase in opportunities for women in clerical occupations it was natural that the supply would increase. What apparently happened in the decade 1941 to 1951, was that many young women who might have entered the labour force in service occupations continued their education enough to qualify for clerical occupations. This is substantiated by the fact that while the median age level of the labour force rose between 1941 and 1951 from 27.1 to 29.3 years, the median age of clerical workers fell from 25.9 to 25.5 years. In the decade 1951 to 1961, the median age of clerical workers rose to 30.1 indicating that the continued expansion of opportunities for women in clerical jobs was attracting older women as well.

Changes in the Supply of Females to Service Occupations

As was indicated earlier,⁽¹¹⁾ between 1941 and 1951, the supply of women to service occupations was reduced. This decline appears to have resulted from the alternative opportunities facing young women about to enter the labour force. The relative earnings of women in service occupations are lower than any other group. (See Table 18). Given the alternative of much higher earnings in clerical occupations, there was an obvious incentive to continue school for a few years and enter the burgeoning clerical field. The women who remained in service occupations in the 1941 to 1951 decade had the lowest years of schooling of almost any

TABLE 19
MEDIAN YEARS OF SCHOOLING IN EACH OCCUPATION, FOR MALES AND FEMALES,
CANADA, 1941, 1951 AND 1961

	Males			Females		
	1941	1951	1961	1941	1951	1961
All Occupations	7.5	8.0	9.0	9.4	9.7	10.1
Managerial	9.1	9.9	10.6	9.1	9.5	9.9
Professional	13+	13+	13+	11.5	12.4	13+
Clerical	10.1	10.2	10.6	10.7	10.6	10.8
Commercial and financial	9.6	10.0	10.5	9.7	9.5	9.7
Manufacturing and construction	7.7	7.8	8.3	8.1	7.7	7.6
Labourers	6.7	6.9	7.2	7.9	7.4	7.7
Transportation and communication	7.5	7.9	8.4	10.0	10.2	10.3
Service	7.5	7.7	8.2	7.6	7.8	8.3
Agriculture	6.6	6.9	7.2	6.8	7.0	7.3
Logging	5.3	5.8	6.1	3.4	7.2	8.2
Fishing	5.9	6.2	6.5	--	7.5	7.0
Mining	6.8	7.1	7.6	6.8	7.3	9.5

SOURCE: See Table 14.

other occupation (see Table 19) and had a higher median age level than most other occupation--32.7 years in 1951.

The increase in the supply of females to service occupations between 1951 and 1961 is probably due to the fact that the women entering the ranks of service occupations did not have sufficient education to compete for clerical jobs. At the same time, the median age of female service workers rose to 37.4 years. Part of the increase in supply may have come from the large postwar immigration to Canada. However, it is apparent that the supply of females to service occupations did not increase as much as the supply to clerical occupations. The earnings of females in service occupations rose relative to males between 1951 and 1961--the only occupation in which this occurred. In addition, the earnings of females in service occupations also increased in relation to the overall figure while the relative earnings of female clerical workers declined.

Conclusion

The increase in female participation in the labour force permitted the increase in demand for clerical workers to raise the number employed in this occupation without raising relative earnings. In fact, the increase in supply of females to clerical occupations was so great that relative earnings fell. At the same time, there was a tremendous increase in the proportion that women made up of all clerical workers.

Part of the growth in supply of women to clerical occupations appears to have been at the expense of service occupations. As a result, the recent increase in the demand for service occupations led to an increase in the relative earnings of women in the service group. The proportion of women in service occupations declined over the period.

FOOTNOTES

- (1) Supply and demand curves for purposes of this study are defined in relative terms. See p. 35.
- (2) If the earnings were high enough, persons outside the labour force who had the requisite skills might be induced to re-enter. However, in most cases this additional number of persons would likely add little in relation to the total available in the labour force.
- (3) In 1931 the population not in school were not asked for the number of years they had attended school.
- (4) The published data have two categories for university education: some university; university degree.
- (5) In addition, the education data were adjusted to the 1951 occupational classification.
- (6) The 1951 and 1961 figures for population five years of age and over were taken from a special note prepared by the General Population Section, Census Division, Dominion Bureau of Statistics, (D.B.S.). The 1941 and 1951 comparison for population fifteen years of age and over was derived from the 1951 census, Volume X.
- (7) It would be interesting to look at earnings by years of schooling within each occupation but such data are not available. If the occupations are ranked by average earnings and median years of schooling, it will be seen that there is a great difference in the position of each occupation when ranked by earnings as compared with the rank by education. For example, the third highest annual earnings in 1961 were attained by mining occupations which stood eighth in terms of education. At the same time, clerical occupations with the second highest median years of schooling ranked seventh in annual earnings. For a discussion of one of the sources of change in supply to clerical occupations, see below.
- (8) See pp. 28-31.
- (9) See Woods and Ostry, op. cit., Chapter X, "Labour Supply in Canada: Population and Immigration".
For a detailed study of the sources and employment of specialized manpower see: Economics and Research Branch, Department of Labour, Skilled and Professional Manpower in Canada, 1945-1965, Queen's Printer, Ottawa, 1957. Prepared for the Royal Commission on Canada's Economic Prospects.
- (10) Within the clerical groups, females are concentrated in the following occupations: stenographers, typists, clerk-typists, and general workers. The following service occupations contain a large number of women: hairdressers; charworkers and cleaners; launderers; practical nurses; waiters and waitresses; and cooks. See: Department of Labour, Canada, Occupational Trends in Canada, 1931 to 1961, Research Program on the Training of Skilled Manpower, Report No. 11, Queen's Printer, Ottawa, 1963, Table 6, pp. 50-54.
- (11) See pp. 62-63.

The Impact on Occupational Composition of Changes in Selected Variables

The demand-supply model which formed the basis for the previous two chapters only provides a general approach to the analysis of changes in occupational composition. The purpose of this chapter is to introduce some selected variables and to examine the impact of their changes on the occupational composition of the labour force. The variables which will be studied are: (1) the industrial distribution of total output; (2) the level of productivity in each industry; and (3) the occupational structure of each industry's labour force.

The analysis in this chapter is conducted only in terms of major industry groups. This means that no consideration is given to intra-industry changes. It is hoped that the approach developed in this chapter will be used subsequently to examine the role of intra-industry changes in the three variables.

The chapter is organized into five sections. The first section describes the three variables which will be used in the analysis. Along with this, the relationship is shown between the variables and the general theoretical framework set out in Chapter 2. The second section discusses the preparation of the relevant data. This is followed by a section outlining the methods used in conducting the analysis. Section four presents the findings of the analysis; while the final section is devoted to an examination of the changes in each variable.

The Variables

At the outset of Chapter 2, the theoretical framework underlying changes in occupational composition was presented. It will be remembered that three elements combine to determine the occupational composition of the labour force at any point in time: (1) aggregate demand for the products of various industries; (2) the production functions of each industry; and (3) relative prices of each of the factors of production.

The theory tells us which elements combine to determine occupational composition. Our problem is to try to measure what impact the changes in each of these elements had on the net shifts in occupational composition.

Unfortunately, we do not have data which correspond to all the parts of the theory. For example, there is little knowledge of the production functions of each industry. In addition, it is not possible to set up demand schedules (both domestic and foreign) for the products of each industry. Since the precise data are not available, we have to work with whatever statistics can be obtained in an effort to shed some light on the actual roles played by the various elements.

On this basis, it was necessary to break down the net changes which occurred in occupational composition into component variables which would permit some analysis of the forces underlying changes in occupational composition. Three variables are dealt with: industrial distribution of total output; labour productivity in each industry sector; and occupational structure of each industry. When these variables are combined, the occupational composition of the labour force is determined.

Industrial distribution of total output refers to the percentage that each industry contributed of the total volume of output of goods and services in the economy.

Productivity is defined in this study as output-per-employed person in each industry. Although output-per-manhour is in some respects a preferable measure, it was only possible to conduct the analysis in terms of persons.⁽¹⁾

Occupational structure is the percentage distribution of each industry's labour force among occupations.

Each of these variables relates to a particular aspect of the general theoretical framework. The industrial distribution of output is determined by the demand schedules for the products of different industry sectors and the relative prices of the products. In the body of the analysis, we look at the impact of the changes in industrial distribution of output on occupational composition. In the final section of the chapter changes in relative prices are examined along with the shifts in industrial distribution of total output. This is done in an effort to determine what changes took place in the demand schedules for products.

Once aggregate demand is given, the relative prices of factors of production taken in combination with the production functions of each industry determine the quantities of the factors that are employed. In the case of the labour factor, the number of persons employed in each occupation is determined.⁽²⁾ Since the production functions of each industry are not known, an alternative approach had to be used to relate the output of each industry to the employment in each occupation. The result was to separate

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the relationship between output and employment in each occupation into two parts: output-per-man in the industry (productivity), and the percentage distribution of the industry's labour force among occupations (occupational structure). Each of these parts is used as a variable in analyzing the process of change in occupational composition.

Both productivity and occupational structure measures can be assigned roles in relation to the underlying theoretical framework. Productivity changes measure two things: (1) the impact on total employment in each industry of changes in technology; and (2) the effect on total employment in each industry of changes in the relative prices of labour and capital considered as homogenous units. Both these impacts are assumed to be neutral with respect to the occupational structure of each industry's labour force.

Occupational structure changes also measure two things: (1) changes in technology which affect the distribution of an industry's labour force among occupations but leave the total employment in the industry unchanged; and (2) changes in relative prices of different types of labour which may alter the distribution of employment in the industry among occupations but which leave the total employment unchanged.⁽³⁾

The findings concerning the impacts of the changes in these three variables will be used to determine whether the main factor responsible for the change in occupational composition toward white-collar workers was:

(1) A shift in the distribution of total output away from industries with high proportions of manual and primary workers;

(2) a change in technology and/or a change in the relative prices of labour and capital (each considered as homogeneous units) which raised the level of productivity in those industries with large proportions of manual and primary occupations; or

(3) a change in technology and/or a change in the relative earnings of occupations which resulted in the occupational structures within industries being altered in favour of white-collar workers.

The Data

This section deals with the preparation of the data which will be used to measure the impact on occupational composition of changes in each variable. The output figures for each industry are estimates of the real domestic product which would have originated in each industry had there been no unemployment in the industry. The details of the methods used to prepare the output data are contained in Appendix B. At this point we will only outline the method which was used and the reasons for the approach.

Real domestic product is a quantity measure of the unduplicated production of individual industries (and the domestic economy when summed) valued in terms of the prices of a base period.⁽⁴⁾ The estimates of full-employment real domestic product by industry of origin were derived in two steps. To begin with, the actual figures for the years 1941, 1951 and 1961 were taken from the D.B.S. publication Indexes of Real Domestic Product by Industry of Origin 1935-61.⁽⁵⁾ Estimates of real domestic product for 1931 drew heavily on data prepared for the Royal Commission on Canada's Economic Prospects.⁽⁶⁾

However, these sources only provided the actual output by industry. We wanted estimates of what the output would have been if every person in the labour force in each industry were employed. These estimates of full employment⁽⁷⁾ output were desired as a means of trying to eliminate the effects of cyclical fluctuations from the data. It was observed in Chapter 4 that each of the census years was at a different point on the economic cycle. In addition, the unemployment rates in each year were also different.⁽⁸⁾ Estimates of full employment output were made by assuming that the potential output-per-man of the unemployed persons in each industry was the same as the output-per-employed person in the industry.⁽⁹⁾ Thus, the full-employment output of each industry was obtained by adding the actual output of each industry to the potential output of the unemployed. It is possible that not all the unemployment at a particular point in time results from cyclical fluctuations. There may be structural, seasonal and frictional unemployment as well. These considerations, however, are beyond the scope of this study.⁽¹⁰⁾

Output-per-employed person was obtained by dividing the real domestic product figure for each industry by the number employed at each census date. Ideally, average annual employment in each industry should have been used as the divisor. However, since each census was conducted in June, the figures are likely to be close to the annual average. Other considerations such as the amount of underemployment at each census date could not be dealt with here.

Occupational structure figures were calculated from labour force data, industry by occupation. The preparation of these statistics is outlined in Appendix A.

Method⁽¹¹⁾

The objective of the analysis is to calculate the impact on the occupational composition of the labour force of the changes which took place in each of the three variables. In particular, we want to observe the impact that each variable had on the proportion of the labour force in each occupation.⁽¹²⁾

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To begin with, the following assumptions were made:

- (1) each variable can change independently;
- (2) the size of the labour force is independent of the changes in each variable;
- (3) the stock of capital is given.

If the variables cannot change independently, then once one variable is assigned a value, the others would be determined. It would be desirable to examine the question of the degree of independence of these variables but there are not sufficient data for this purpose. The need for further research on this subject is cited in the concluding chapter.

For the same reasons as have just been given, the size of the labour force has been assumed to be independent of any change in the variables.

It was not possible to include changes in the stock of capital in the analysis. There is no series which covers the years 1931 to 1961 and the data could not be developed. This is an unfortunate gap, since it means that questions of substitution between labour and capital cannot be dealt with. However, it is hoped that in later research the analysis can be extended to include capital data. (13)

The relationship between occupational composition of the labour force and the three variables can be expressed in symbols as follows:

$$C_i = \frac{\sum_{j=1}^n S_{ij} \cdot Q_j}{\sum_{j=1}^n P_j}$$

where C_i is the proportion of the total labour force in occupation i , S_{ij} is the percentage of the employment in the industry j which is in occupation i , Q_j is that amount of the total output of the economy which originates in the industry j , and P_j is the output-per-man in industry j .

Two steps are required to measure the impact of changes in S_i , Q and P on C_i between two points in time. The first step is to calculate the distributions of the labour force among occupations which would result when each of the variables changes from the base year to the final year values: (1) by itself and (2) in combination with one or both of the remaining variables. These calculations produce eight percentage distributions of the labour force, the two actual distributions in the base year and final year, and six hypothetical distributions. The two actual distributions represent the cases where: (1) none of the variables change; and (2) where

all of the variables change. The six other results are produced by the various possible combinations of the variables. For example, one of these cases would be the combination of the final year output in industry j taken with the base year productivity in industry j and the base year percentage that occupation i represented of industry j 's work force.

This combination can be expressed symbolically with \underline{O} representing base year values, and $\underline{1}$ representing final year values:

$$C_i = \frac{\sum_{j=1}^n S_{ijo} \frac{Q_{j1}}{P_{jo}}}{\sum_{j=1}^n \frac{Q_{j1}}{P_{jo}}}$$

The entire eight combinations are now given with the symbols in brackets after each expression indicating which variable(s) have changed.

$$1. \quad C_i = \frac{\sum_{j=1}^n S_{ijo} \frac{Q_{jo}}{P_{jo}}}{\sum_{j=1}^n \frac{Q_{jo}}{P_{jo}}} \quad (\text{none of the variables have changed})$$

$$2. \quad C_i = \frac{\sum_{j=1}^n S_{ij1} \frac{Q_{j1}}{P_{j1}}}{\sum_{j=1}^n \frac{Q_{j1}}{P_{j1}}} \quad (\text{all of the variables have changed})$$

$$3. \quad C_i = \frac{\sum_{j=1}^n S_{ijo} \frac{Q_{j1}}{P_{jo}}}{\sum_{j=1}^n \frac{Q_{j1}}{P_{jo}}} \quad (Q)$$

$$4. \quad C_i = \frac{\sum_{j=1}^n S_{ijo} \frac{Q_{jo}}{P_{j1}}}{\sum_{j=1}^n \frac{Q_{jo}}{P_{j1}}} \quad (P)$$

$$5. \quad C_i = \frac{\sum_{j=1}^n S_{ij1} \frac{Q_{jo}}{P_{jo}}}{\sum_{j=1}^n \frac{Q_{jo}}{P_{jo}}} \quad (S)$$

$$6. \quad C_i = \frac{\sum_{j=1}^n S_{ijo} \frac{Q_{j1}}{P_{j1}}}{\sum_{j=1}^n \frac{Q_{j1}}{P_{j1}}} \quad (Q \text{ and } P)$$

$$7. \quad C_i = \frac{\sum_{j=1}^n S_{ij1} \frac{Q_{j1}}{P_{jo}}}{\sum_{j=1}^n \frac{Q_{j1}}{P_{jo}}} \quad (Q \text{ and } S)$$

$$8. \quad C_i = \frac{\sum_{j=1}^n S_{ij1} \frac{Q_{jo}}{P_{j1}}}{\sum_{j=1}^n \frac{Q_{jo}}{P_{j1}}} \quad (S \text{ and } P)$$

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The second step is to measure the impact on occupational composition of the change in each variable. This is done by selecting various pairs of the eight expressions so that the change in occupational composition results from the change in only one variable. For each variable there are four pairs of expressions which can be chosen. For example, take variable P (productivity). If expression 1. is subtracted from expression 4., then the change in C_i will reflect only the change in P. In addition, if expression 3. is subtracted from expression 6., then the change in C_i also reflects only the change in P since the final value of Q is contained in both expressions and will therefore cancel out. Similarly, when expression 5. and 8. and 2. and 7. are taken, the results also show the effect of the change in P on the percentage of the labour force in occupation i.

The four pairs of expressions which indicate the impact on occupational composition of the change in each variable are listed below. The numbers identify the expressions presented above with the minus sign to indicate which expressions are being subtracted.

Q: 3-1; 7-5; 6-4; 2-8.
P: 6-3; 2-7; 4-1; 8-5.
S: 2-6; 7-3; 5-1; 8-4.

In the case of each variable it would be possible to simply average the four different results to obtain one estimate of the impact on occupational composition of each variable. However, the sum of these averages will not equal the net change in each occupation's proportion of the labourforce. The reason for this is that these averages for each variable are not based on a complete sequence of events in the process by which each variable changes. We call these the unweighted averages.

This point can be explained as follows. We know that each of the three independent variables has changed between two points in time. All we are told are the initial and final values of the variables. We want to calculate how much of the net change in each occupation's proportion (the dependent variable) came from the change in each independent variable. To begin with, we assume that the variables change one at a time. On this basis, there are six possible sequences by which the three variables can change:

	First Change	Second Change	Third Change
a)	Q	P	S
b)	Q	S	P
c)	P	Q	S
d)	P	S	Q
e)	S	P	Q
f)	S	Q	P

The components of each step for each sequence are found by using different pairs of the eight expressions presented above. For example, sequence a) where first output changes, then productivity, then occupational structure is the same as taking the following pairs of expressions: 3-1; 6-3; and 2-6. This means that first output changes with the other two variables remaining unchanged. Next, output and productivity change with occupational structure remaining at the base year value. Finally, all three variables change.

The six sequences produce a total of eighteen pairs of expressions. The impact of the change in each variable is found by taking those pairs of expressions in which only that one particular variable has changed. The result is six pairs of expressions for each variable, the four original pairs mentioned above plus the two expressions which represent the cases where that variable is the first to change and where it is the last to change.

These six pairs of expressions are:

Q: 3-1; 3-1; 7-5; 6-4; 2-8; 2-8.

P: 6-3; 2-7; 2-7; 4-1; 4-1; 8-5.

S: 2-6; 7-3; 5-1; 2-6; 8-4; 5-1.

The arithmetic mean can be calculated for each independent variable. We refer to this value as the weighted average. When the weighted averages are added, the total equals the net change in each occupation's proportion of the labour force.

Undoubtedly, this method will appear to be unduly complex and cumbersome.⁽¹⁴⁾ Why didn't we simply take one sequence of events and use this to measure the impact of each variable? For example, we could have measured the impact of the change in each variable by assuming that the three factors changed in the order: Q; P; S. That is, first output of each industry changes. Next, on the basis of the new output, we calculate the employment in each industry by applying the new productivity figure. Finally, we find the number in each occupation within each industry by applying the new occupational structure to the final total employment.

In terms of the expressions presented above, the impact of the change in each variable would be given by the following:

Q: 3-1

P: 6-3

S: 2-6

As can be seen from the previous discussion, this approach only gives one of the ways by which the impact of the variables could be measured. There is no basis on which to assume that this sequence is representative enough to serve as a measure of the occupational impact of the variables. If another sequence were selected, the results would likely be different and perhaps the order of importance of the variables would be changed.

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Consequently, it was decided to take all the possible sequences and average the results for each variable. In Appendix C, the impacts of each variable using the different possible sequences are shown along with the averages. There are two significant observations that emerge from this data:

(1) the rank order of the impacts of the three variables does not change no matter which sequence of events is used; and

(2) the range of the results using the different sequences is not relatively large and the average figures always lie half-way between the largest and smallest values for each variable.

On this basis, we have concluded that, (1) none of the individual sequences produces a representative measure of the impact of the change in each variable; and (2) the weighted average is the most meaningful measure of the impact on occupational composition of the changes in each variable.

The Analysis

Three suggestions were made earlier as to the main factor underlying the change in occupational composition toward white-collar workers. These suggestions will now be examined in the light of the impact on occupational composition of the changes in the variables. The discussion deals first with the net changes between 1931 and 1961 and then with the decade-by-decade developments.

Net Changes Between 1931 and 1961

It has been suggested that the main factor underlying the shift to white-collar workers was a change in the industrial distribution of total output away from industries with high proportions of manual and primary workers. Table 20 shows that this was not the major factor in the shift to white-collar workers. The main impact of changes in industrial distribution of output was the increase in manufacturing and construction occupations and the reduction in agricultural occupations. (See Column 4). Although shifts in the industrial distribution of output tended to increase white-collar occupations, the contributions by the two other variables were far more important.

The second suggestion was that productivity changes in industries with high proportions of manual or primary occupations were responsible for the shift of the occupational composition toward white-collar workers. Column (5) of Table 20 shows that changes in productivity contributed a greater amount to the relative increase in white-collar occupations than the changes in either of the other variables. The only exception occurred in the case of clerical occupations where the change in occupational structure was more important.

TABLE 20
SOURCES OF CHANGE IN THE OCCUPATION COMPOSITION⁽¹⁾ OF THE LABOUR FORCE, ⁽²⁾ CANADA, ⁽³⁾ COMPARING 1931 AND 1961

	Percentage Distribution			Amount of Net Change Arising From Change In		
	1931	1961	Net Change	Industrial Distribution of Total Output	Productivity in Each Industry	Occupational Structure of Each Industry
All Occupations	100.0	100.0	0.0	0.0	0.0	0.0
Managerial	5.6	8.1	2.5	0.8	1.0	0.7
Professional	6.1	10.3	4.2	0.6	3.8	-0.3
Clerical	6.7	13.3	6.6	1.5	1.8	3.3
Commercial and financial	6.1	8.0	1.9	1.0	1.5	-0.6
Manufacturing and construction	16.2	22.3	6.1	5.6	-2.7	3.1
Labourers	11.3	5.6	-5.7	2.2	-0.5	-7.4
Transportation and communication	6.3	8.1	1.8	1.2	-0.5	1.1
Service	9.2	11.1	1.9	-1.2	2.2	0.9
Agriculture	28.8	10.5	-18.3	-11.8	-6.3	-0.2
Logging	2.3	1.9	-0.4	-0.5	0.3	-0.3
Fishing						
Mining	1.5	1.1	-0.4	0.7	-0.6	-0.5

SOURCES: Columns (1) and (2) see Appendix A; Columns (1), (5) and (6) see Appendix C.

- (1) Occupation (and Industry) figures were adjusted to the 1951 classification basis. Occupation (and Industry) Not Stated were prorated among other occupations - see Appendix A.
- (2) Fourteen years of age and over for 1931, 1941 and 1951; fifteen years of age and over for 1961. Excludes: Armed forces; persons seeking work for the first time; persons who did not specify an industry or an occupation.
- (3) Not including Yukon and Northwest Territories. Including Newfoundland in 1951 and 1961.

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The increase in the proportion of white-collar occupations stemming from productivity changes was mainly at the expense of declines in the manufacturing and construction and agricultural occupations. There was an especially large drop in the proportion of agricultural workers as the result of productivity changes. Service occupations were the only non white-collar group whose proportion of the labour force rose as a result of productivity changes. (15)

Productivity changes contributed the largest amount to the increase in the proportion of white-collar occupations, but in only two cases (professional and commercial and financial occupations) did this increase exceed half the net gain in the occupation.

At this point there may be some questions as to how productivity changes actually affect occupational composition. The basis is as follows: given no change in the industrial distribution of output, and assuming no change in the occupational structure of each industry, a greater than average increase in productivity in an industry will tend to reduce the labour force proportion of those occupations which have a large share of the work force in the industry. By the same token, the smaller the increase in productivity relative to the average, the greater will be the tendency to increase the share of the labour force in the occupations which form a large part of that industry. Thus the increase in white-collar occupations arising from productivity changes means that, on balance, there was a smaller than average increase in the productivity of industries whose employees were predominantly in white-collar occupations. A similar conclusion applies in the case of service occupations.

The third factor which was suggested as a source of the change in occupational composition toward white-collar occupations was a change in technology and/or a change in the relative earnings of occupations which resulted in the occupational structures within industries being altered in favour of white-collar workers. Column (6) of Table 20 shows that occupational structure changes had a significant impact only on clerical occupations. For the white-collar group as a whole, occupational structure changes had the smallest impact of the three variables. In fact, in two cases--professional and commercial and financial occupations, the change in this variable tended to reduce the labour force proportions.

Occupational structure changes also tended to increase manufacturing and construction occupations. The gains in this group and in clerical occupations were made at the expense of labourers who experienced their sharpest reduction as the result of occupational structure changes.

Decade by Decade Changes 1931 to 1961

In Chapter 4, it was observed that for the most part the significant changes in occupational composition were produced by continuous changes decade by decade. The only exceptions were labourers, where there was a pause in the downward trend during the middle decade; and manufacturing and construction whose upward trend stopped in 1951. The question to be dealt with here is whether the impacts of each variable were also consistent on a decade-by-decade basis. The answer is a qualified "yes". In two occupations, the clerical and professional groups, the same variable had the greatest impact in each decade as well as for the overall period. In the other three occupations, the variable which was dominant over the entire period also tended to exert the most impact decade by decade.

The decade-by-decade analysis of the impacts of the three variables is shown in Table 21. It can be seen that for agricultural occupations changes in the industrial distribution of output were the dominant influence except in the decade 1941-1951. In that period, productivity changes had an even greater impact. In the case of labourers, occupational structure changes were paramount in the two decades in which this occupation declined, but in the middle period (1941-1951) the positive productivity change offset the decline arising from occupational structure shifts. Changes in the industrial distribution of total output had the greatest overall impact on manufacturing and construction occupations but this was the product of developments only in the 1931-1941 decade. After that, productivity changes determined what happened to the proportion of the labour force in manufacturing and construction occupations.

These are the results of the analysis of the impact on occupational composition of changes in the selected variables. The major findings will be summarized in the conclusion to this chapter.

The Changes in Each of the Variables

The changes in each of the three variables over the period 1931 to 1961 will be presented in this section. The purpose is to determine in which industries the changes in each variable originated. The variables will be dealt with in the following order: (1) industrial distribution of total output; (2) productivity in each industry; and (3) occupational structure of each industry.

Industrial Distribution of Total Output

There are two objectives in looking at changes in industrial distribution of total output: (1) to identify the major changes

TABLE 21
SOURCES OF THE INTERDECADE CHANGES IN THE OCCUPATIONAL COMPOSITION OF THE LABOUR FORCE, CANADA, 1931 TO 1961

	1931-1961				1931-1941				1941-1951				1951-1961			
	Change in Percent of Labour Force		Amount of Change Arising from Change in:		Change in Percent of Labour Force		Amount of Change Arising from Change in:		Change in Percent of Labour Force		Amount of Change Arising from Change in:		Change in Percent of Labour Force		Amount of Change Arising from Change in:	
	Q	P	S	Q	P	S	Q	P	S	Q	P	S	Q	P	S	S
All Occupations																
Managerial	2.5	0.8	1.0	0.7	-0.2	0.5	-0.5	-0.2	0.5	-0.5	-0.2	0.5	0.3	0.3	-0.1	
Professional	4.2	0.6	3.8	-0.3	0.6	1.0	0.5	-0.8	1.0	0.5	0.4	0.8	1.1	1.4	0.3	
Clerical	6.6	1.5	1.8	3.3	0.6	0.4	0.4	-0.2	0.4	0.4	1.2	3.6	0.7	0.7	0.9	
Commercial and financial	1.9	1.0	1.5	-0.6	-0.2	0.8	-0.7	-0.3	0.8	-0.7	0.8	0.9	0.3	0.2	0.7	
Manufacturing and construction	6.1	5.6	-2.7	3.1	4.6	-3.5	3.9	4.2	-3.5	3.9	0.6	2.5	1.2	-1.7	-0.5	
Labourers	-5.7	2.2	-0.5	-7.4	-4.9	-1.2	-4.8	1.0	-1.2	-4.8	0.3	0.4	0.5	-0.4	-1.3	
Transportation and communication	1.8	1.2	-0.5	1.1	0.1	-0.6	0.6	0.1	-0.6	0.6	0.2	1.6	0.8	-0.9	0.1	
Service	1.9	-1.2	2.2	0.9	1.3	2.0	0.9	-1.5	2.0	0.9	0.6	-1.8	-0.2	2.2	0.4	
Agriculture	-18.3	-11.8	-6.3	-0.2	-2.9	-0.3	-0.1	-2.6	-0.3	-0.1	-4.7	-9.8	-4.6	-1.0	-1.0	
Logging	-0.4	-0.5	0.3	-0.2	0.8	1.0	-0.1	-0.1	1.0	-0.1	0.2	0.1	-0.4	-0.2	-0.1	
Fishing											-0.1	-0.2	-0.2	-0.2	0.0	
Mining	-0.4	0.7	-0.6	-0.5	0.2	-0.1	-0.1	0.4	-0.1	-0.1	-0.3	-0.4	0.5	-0.6	-0.2	

SOURCE: See Appendix C.

Key to Symbols: Q - industrial distribution of total output
P - productivity in each industry
S - occupational structure of each industry

which occurred over the period and in which decades they occurred; and (2) to try to determine whether these changes resulted from changes in the relative prices of the products of various industries or whether there were shifts in demand curves for products. Table 22 presents estimates of full-employment output (real domestic product) by industry of origin. As was noted earlier, estimates were prepared on a full-employment basis in an effort to eliminate the effects of cyclical fluctuations. (16)

The major impact on occupational composition of changes in industrial distribution of total output was the large increase in manufacturing and construction occupations and the even greater decline in agricultural occupations. Since agricultural occupations make up 98 percent of the agriculture industry, and manufacturing and construction occupations represent over half the manufacturing industry, it is not surprising to discover that the most significant changes in industrial distribution of output were the increase in the proportion in the manufacturing industry and the decline of the agriculture industry. The other changes were of a much smaller magnitude.

These major shifts resulted from very different inter-decade patterns of change. All of the shift to the manufacturing sector occurred between 1931 and 1941. After that, manufacturing's proportion of total output declined in each decade. The initial shift to manufacturing was offset by declines in almost every other industry (except mining and public utilities). However, agriculture did not decrease the most in this decade, construction and finance had larger reductions. The large overall decline in agriculture resulted from the continuous reductions in each decade of the 1931 to 1961 period.

Did these output shifts result from changes in relative prices of products or were there changes in demand? In order to examine this question we constructed a crude estimate of relative price indices for each industry. The method was to divide the actual Gross Domestic Product (in current dollars) by the actual Real Domestic Product (a measure of volume). The results were then converted into relative terms by taking each figure as a percentage of the total for each year. See Table 23. (17)

Since we don't know the shape of the demand curves for the products of each industry sector, it is difficult to distinguish between a movement along a demand curve as the result of a change in prices, and a shift in a demand curve. Using the available data we can only identify two cases. On the one hand, if relative prices increased in an industry, and the share of total output rose at the same time, then this would indicate that there had been an increase in demand (a shift in the demand curve to the right). Conversely, if both relative prices and proportion of total output fell, then this would imply a decrease in demand.

TABLE 22
ESTIMATES OF FULL-EMPLOYMENT REAL DOMESTIC PRODUCT, BY INDUSTRY OF ORIGIN,
CANADA, 1931-1961

	Estimates in Millions of Dollars				Percentage Distribution				Interdecade Changes in Percentage Distribution			
	1931	1941	1951	1961	1931	1941	1951	1961	1931-61	1931-41	1941-51	1951-61
All Industries	8,176	11,210	16,080	23,561	100.0	100.0	100.0	100.0	0.0	0.0	0.0	0.0
Agriculture	1,417	1,722	1,932	1,919	17.3	15.4	12.0	8.1	-9.2	-1.9	-3.4	-3.9
Forestry	285	297	458	503	3.5	2.6	2.8	2.1	-1.0	-0.3	0.2	-0.7
Fishing	307	69	91	98	3.8	0.6	0.6	0.4	2.1	1.1	0.0	-0.2
Mining		547	609	1,379		4.9	3.8	5.9			-1.1	2.1
Manufacturing	1,700	3,468	4,877	6,799	20.8	30.9	30.3	28.8	8.0	10.1	-0.6	-1.5
Construction	738	689	1,075	1,899	9.0	6.1	6.7	8.1	-0.9	-2.9	0.6	1.4
Electricity, gas and water	93	192	358	860	1.1	1.7	2.2	3.7	2.6	0.6	0.5	1.5
Transportation and communication	748	1,024	1,421	2,264	9.1	9.1	8.8	9.6	0.5	0.0	-0.3	0.8
Trade	1,178	1,470	2,362	3,582	14.4	13.1	14.7	15.2	0.8	-1.3	1.6	0.5
Finance	432	311	634	907	5.3	2.8	3.9	3.9	-1.4	-2.5	1.1	0.0
Service	548	605	886	1,464	6.7	5.4	5.5	6.2	-0.5	-1.3	0.1	0.7
Community and business	254	295	613	955	3.1	2.6	3.8	4.1	1.0	-0.5	1.2	0.3
Government	53	50	75	57	0.6	0.4	0.5	0.2	-0.4	-0.2	0.1	-0.3
Recreation	423	478	690	883	5.2	4.3	4.3	3.7	-1.5	-0.9	0.0	-0.6
Personal												

TABLE 23
PRICE INDEXES FOR EACH INDUSTRY AS A PERCENTAGE OF THE TOTAL INDEX

	1931	1941	1951	1961
All Industries	100	100	100	100
Agriculture	44	65	111	60
Forestry	47	71	89	64
Fishing		102	104	79
Mining	118	127	118	80
Manufacturing	123	108	101	97
Construction	72	71	79	82
Electricity, gas and water			123	99
Transportation and communication	139	126	181	102
Trade	102	100	113	99
Finance	96	106	87	107
Service	130	102	107	141
Government	170	94	107	145
All other service	121	108	107	139

SOURCE: See Appendix B.

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Table 23 shows that relative prices in the manufacturing sector declined between 1931 and 1941.⁽¹⁸⁾ In this same period there was a large increase in the manufacturing industry's share of total output. On this basis we cannot say for certain that there was an increase in demand since the reduction in relative prices would have contributed to an increase in the share of output. However, given the large increase in manufacturing output and taking into account that by 1941 the Canadian economy had begun gearing for World War II, it is likely that there was a large increase in the demand for the products of the manufacturing industry.

In the decades 1941 to 1951 and 1951 to 1961, both relative prices and proportion of output originating in the manufacturing sector declined. In these cases, there was definitely a decline in demand.

In the agriculture industry, relative prices rose in the two decades between 1931 and 1951 while the share of total output fell.⁽¹⁹⁾ Here we do not know whether demand decreased or whether the increase in relative prices produced the decline in the share of output. From 1951 to 1961, both relative prices and proportion of output in agriculture declined. For this latter period, therefore, it can be said that the decline in share of output originating in agriculture resulted from a drop in demand.

As a general conclusion it can be said that changes in both relative prices and demand were responsible for the two major shifts in the industrial distribution of output.

Productivity in Each Industry

The patterns of change in the productivity levels of each industry (real domestic product per employed person in each industry) are presented in Table 24. If the results of the earlier analysis are recalled, it will be remembered that productivity changes produced substantial increases in professional, service and commercial and financial occupations, while reducing the proportion of the labour force in the agricultural and manufacturing and construction groups. One look at the percentage changes in the productivity figures will indicate why these occupational changes occurred.

Given no change in either the industrial distribution of output or in the occupational structure of each industry, a greater than average increase in productivity in an industry will tend to reduce the labour force proportion of the occupation which forms a large part of the work force in that industry. In a similar manner, the smaller the increase in productivity relative to the average, the greater will be the tendency to increase the proportion of the labour force in the occupation which has a large part of the work force in this industry.⁽²⁰⁾

TABLE 24
REAL DOMESTIC PRODUCT PER EMPLOYED PERSON BY INDUSTRY OF ORIGIN, CANADA, 1931-1961

	1949 Dollars				Percentage Change			
	1931	1941	1951	1961	1931-61	1931-41	1941-51	1951-61
All Industries	2,051	2,651	3,118	3,782	84	29	18	21
Agriculture	1,261	1,591	2,336	2,997	138	26	47	28
Forestry	2,921	3,167	3,524	4,618	41	-15	11	31
Fishing	4,277	1,345	1,794	2,818	170	37	33	57
Mining	2,125	5,864	5,866	11,560	114	66	0	97
Manufacturing	2,516	3,525	3,574	4,549	61	21	1	27
Construction	3,320	3,047	3,050	4,054	267	123	0	33
Electricity, gas and water	2,361	3,502	3,279	4,527	92	48	-6	38
Transportation and communication	2,979	3,139	3,321	3,844	29	5	6	16
Trade	4,645	3,436	4,398	3,949	-15	-26	28	-10
Finance	2,178	2,178	2,054	1,915	-12	0	-6	-7
Service	2,516	2,516	3,013	2,629	4	0	20	-13
Community and business	2,805	2,805	2,615	1,425	-49	0	-7	-46
Government	1,300	1,300	2,196	1,986	53	0	69	-10

SOURCE: See Appendix B.

- (1) Real Domestic Product per employed person in 1931 was assumed to be the same as the 1941 figure - see Appendix B.
- (2) Includes Dominion Post Office.
- (3) Excludes Dominion Post Office.

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Professionals make up over half the community and business service industry. This industry experienced a decline in productivity between 1931 and 1961 while the overall gain was 84 percent.⁽²¹⁾ It is not surprising to see that professionals increased their proportion of the labour force as a result of productivity changes.

The same observation applies to service and commercial and financial occupations which had large shares of the service and trade industries respectively. The productivity of both these industries grew at a slower rate than the average for the economy.

The reverse was true for agricultural and manufacturing and construction occupations. Both agriculture and manufacturing industries achieved large gains in productivity between 1931 and 1961. The impact of the latter industry on manufacturing and construction occupations was tempered a bit by slower than average growth in the productivity level in the construction industry.

The decade-by-decade patterns of the changes in productivity are quite interesting but we can only briefly comment on them. The most significant developments were the large gains in productivity in the 1931-41 and 1951-61 decades by manufacturing, public utilities (electricity, water and gas), mining and transportation and communication. In the decade 1941-51, there was virtually no productivity increase in any of these sectors and, in fact, some losses. Agriculture had the steadiest rate of productivity increase decade by decade with the largest gain in the period 1941-51. There was also a large increase in output per person in the personal service sector between 1941 and 1951.⁽²²⁾

In the first section of this chapter, it was stated that productivity changes result from: (1) the impact on employment in an industry of changes in technology and (2) the effect on employment in an industry of changes in the relative prices of labour and capital.⁽²³⁾ It was assumed that these impacts were neutral with respect to the occupational structure of the industry's work force. Unfortunately, we do not have the data to measure separately the effects of changes in technology and the amount of substitution between capital and labour.

Occupational Structure of Each Industry

Changes in the occupational structure of certain industries produced two significant changes in the percentage distribution of the total labour force among occupations: (1) a large increase in clerical workers; and (2) an even greater decline in labourers. In addition, occupational structure changes also contributed towards the increase in manufacturing and construction occupations.

A change in occupational structure of an industry means a shift in the percentage distribution of the industry's labour force

among occupations. The fact that occupational structure changes produced the results just cited means that in certain industries there must have been a decline in the percentage of labourers and an increase in the percentage of clerical workers and manufacturing and construction occupations. All of these changes do not have to occur in the same industries since there could be other occupations involved in the shifts as well. Table 25 presents the occupational structure of each industry in 1931 and 1961, while Table 26 shows the decade by decade changes in each industry's occupational structure. (24)

In the final analysis, the impact of occupational structure changes depends on the amount of change in an occupation's percentage of an industry together with the size of the industry's labour force. The larger the labour force in the industry, the greater will be the overall impact of a given change in occupational structure. The data in Tables 25 and 26 could be studied in relation to the size of each industry's labour force to really pinpoint the impact of occupational structure changes within certain industries. Such an approach is very valuable for some purposes but is too detailed for the general observations that we want to make here.

The main point is that between 1931 and 1961 most industries had an increase in the percentage of their work force in clerical and manufacturing and construction occupations while at the same time there was a general reduction in the percentage held by labourers. The decade-by-decade changes for each occupation were different. Manufacturing and construction occupations made all of their gains between 1931 and 1941. Labourers suffered sharp cutbacks in every industry in this period. Labourers also declined as a percentage of most industries in the next two decades.

Occupational structure changes could result from changes in technology and/or changes in the relative earnings of occupations. This is assuming no change in output per person. Although we have earnings data for each occupation, we do not know how much of the change in proportion of each industry's work force is the result of the changes in earnings data. We were not able to separate the impact of technological changes from the effects of changes in the relative earnings.

Conclusion

This chapter examined the impact on the occupational composition of the labour force of changes in the following three variables: (1) industrial distribution of total output; (2) productivity in each industry; and (3) occupational structure of each industry.

It was discovered that changes in industrial distribution were primarily responsible for: the increase in the proportion of

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manufacturing and construction occupations, and for the decline in agricultural occupations. Productivity changes had the effect of increasing the relative number of persons in professional and commercial and financial occupations. Productivity changes also produced a sizeable reduction in agricultural occupations and tended to reduce manufacturing and construction occupations. Occupational structure changes were responsible for half the net gain in clerical occupations and also tended to increase manufacturing and construction occupations. All of the large reduction in the proportion of labourers resulted from occupational structure changes.

TABLE 25
LABOUR FORCE, PERCENTAGE DISTRIBUTION, NET CHANGE AND INDUSTRY BY OCCUPATION
CANADA, 1931 AND 1961

	Total		Managerial			Professional			Clerical		
	1931	1961	1931	1961	Net Change	1931	1961	Net Change	1931	1961	Net Change
All Industries	100	100	6	8	+2	6	10	+4	7	13	+6
Agriculture	100	100	0	0	0	0	0	0	0	0	0
Forestry	100	100	2	3	+1	0	2	+2	1	2	+1
Fishing	100	100	2	4	+2	2	8	+6	2	7	+5
Mining	100	100	5	6	+1	2	5	+3	8	12	+4
Manufacturing	100	100	4	8	+4	1	2	+1	1	3	+2
Construction	100	100	4	6	+2	7	10	+3	13	21	+8
Electricity, gas and water	100	100	5	5	0	1	4	+3	12	18	+6
Transportation and communication	100	100	28	23	-5	1	2	+1	13	18	+5
Trade	100	100	9	13	+4	4	3	-1	52	52	0
Finance	100	100	0	1	+1	75	57	-18	7	13	+6
Service	100	100	6	8	+2	8	12	+4	25	29	+4
Community and business	100	100	24	18	-6	14	7	-7	7	12	+4
Government	100	100	6	11	+5	1	1	0	2	4	+2
Recreation	100	100									
Personal	100	100									

CHANGES IN SELECTED VARIABLES

TABLE 25 (Continued)

	Commercial Financial			Manufacturing Construction			Labourers			Transportation Communication		
	1931	1961	Net Change	1931	1961	Net Change	1931	1961	Net Change	1931	1961	Net Change
All Industries	6	8	+2	16	22	+6	11	6	-5	6	8	+2
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	0	0	0	2	9	+7	0	3	+3	1	5	+4
Fishing	0	1	+1	11	23	+12	1	3	+2	2	4	+2
Mining												
Manufacturing	5	6	+1	52	54	+2	25	9	-16	2	5	+3
Construction	0	0	0	49	66	+17	41	15	-26	2	4	+2
Electricity, gas and water	4	2	-2	34	28	-6	27	11	-16	8	19	+11
Transportation and communication	2	2	0	5	4	-1	17	7	-10	55	56	+1
Trade	39	34	-5	6	10	+4	4	5	+1	7	7	0
Finance	31	23	-5	0	1	+1	0	0	0	2	1	-1
Service												
Community and business	1	1	0	2	3	+1	1	1	0	0	1	+1
Government	1	1	0	5	13	+8	27	9	-18	7	4	-3
Recreation	2	4	+2	2	5	+3	16	3	-13	1	1	0
Personal	1	1	0	1	4	+3	2	1	-1	2	2	0

TABLE 25 (Concluded)

	Service			Agricultural			Logging Fishing			Mining		
	1931	1961	Net Change	1931	1961	Net Change	1931	1961	Net Change	1931	1961	Net Change
All Industries	9	11	+2	29	11	-18	2	2	-	1	1	-
Agriculture	0	0	0	100	98	-2	0	0	0	0	0	0
Forestry	3	4	+1	0	0	0	90	72	-18	0	0	0
Fishing	1	2	+1	0	0	0	0	0	0	78	48	-30
Mining												
Manufacturing	1	2	+1	0	0	0	0	0	0	0	0	0
Construction	1	1	0	0	0	0	0	0	0	0	1	+1
Electricity, gas and water	2	3	+1	0	1	+1	0	0	0	0	0	0
Transportation and communication	3	4	+1	0	0	0	0	0	0	0	0	0
Trade	1	2	+1	0	0	0	0	0	0	0	0	0
Finance	1	5	+4	0	0	0	0	0	0	0	0	0
Service												
Community and business	13	23	+10	0	0	0	0	0	0	0	0	0
Government	20	20	0	1	2	+1	0	0	0	0	0	0
Recreation	31	40	+9	1	8	+7	1	3	+2	0	0	0
Personal	84	75	-9	1	1	0	0	0	0	0	0	0

TABLE 26
INTERDECADE CHANGE IN EACH OCCUPATION'S PERCENTAGE OF EACH INDUSTRY
1931-1961

	Managerial				Professional				Clerical			
	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61
All Industries	2	0	2	0	4	1	1	3	7	1	4	2
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	+1	-1	2	0	+2	0	1	1	+1	0	1	0
Fishing	+2	-1	2	1	+6	1	2	3	+5	0	2	3
Manufacturing	+1	-2	2	1	+3	1	0	2	+4	1	2	1
Construction	+4	-1	3	2	+1	1	0	0	+2	0	2	0
Electricity, gas and water	+2	0	0	2	+3	2	-2	3	+8	1	2	5
Transportation and communication	0	-1	1	0	+3	1	0	2	+6	0	2	4
Trade	-5	0	-3	-2	+1	1	0	0	+5	1	3	1
Finance	+4	0	2	2	-1	3	-2	-2	0	-7	8	-1
Service												
Community and business	+1	0	0	1	-18	-2	-13	-5	+6	-1	4	3
Government	+2	+4	1	-3	+4	3	-1	2	+4	+9	0	-5
Recreation	-6	-5	4	-5	-7	2	-8	-1	+4	+3	2	-1
Personal	+5	0	7	-2	0	0	0	0	+2	0	2	0

TABLE 26 (Continued)

	Commercial Financial				Agricultural				Logging Fishing			
	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61
All Industries	2	0	1	1	-18	-3	-10	-6	0	1	0	-1
Agriculture	0	0	0	0	-2	0	-1	-1	0	0	0	0
Forestry	0	0	0	0	0	0	0	0	-18	-2	-10	-6
Fishing	+1	0	1	0	0	0	0	0	0	0	0	0
Mining												
Manufacturing	+1	-2	2	1	0	0	0	0	0	0	0	0
Construction	0	0	0	0	0	0	0	0	0	0	0	0
Electricity, gas and water	-2	0	-3	1	+1	0	0	1	0	0	0	0
Transportation and communication	0	0	0	0	0	0	0	0	0	0	0	0
Trade	-5	-1	-6	2	0	0	0	0	0	0	0	0
Finance	-8	-5	-3	0	0	0	0	0	0	0	0	0
Service												
Community and business	0	0	0	0	0	0	1	-1	0	0	0	0
Government	0	0	0	0	+1	0	0	1	0	0	0	0
Recreation	+2	0	1	1	+7	0	4	3	+2	-1	1	2
Personal	0	0	0	1	0	-1	1	0	0	0	1	-1

TABLE 26 (Continued)

	Mining				Manufacturing Construction				Labourers			
	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61
All Industries	0	0	0	0	6	5	2	-1	-6	-5	0	-1
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	0	0	0	0	+7	1	2	9	+3	1	1	1
Fishing	-30	-3	-15	-12	+12	2	4	22	+2	1	2	-1
Manufacturing	0	0	0	0	+2	12	-7	-3	-16	-11	-2	-3
Construction	+1	0	1	0	+17	17	-5	5	-26	-16	-4	-6
Electricity, gas and water	0	0	0	0	-6	6	-12	0	-16	-14	9	-11
Transportation and communication	0	0	0	0	-1	1	1	-3	-10	-8	-2	0
Trade	0	0	0	0	+4	0	5	-1	+1	-1	1	1
Finance	0	0	0	0	+1	1	0	0	0	0	0	0
Service	0	0	0	0	+1	0	2	-1	0	0	0	0
Community and business	0	0	0	0	+8	0	6	2	-18	-16	-4	2
Government	0	0	0	0	+3	0	2	1	-13	-7	-5	-1
Recreation	0	0	0	0	+3	0	1	2	-1	1	1	-1
Personal	0	0	0	0								

TABLE 26 (Concluded)

	Transportation Communication				Service			
	1931-61	1931-41	1941-51	1951-61	1931-61	1931-41	1941-51	1951-61
All Industries	2	0	2	0	2	1	-2	2
Agriculture	0	0	0	0	0	0	0	0
Forestry	+4	2	2	0	+1	0	1	0
Fishing	+2	0	2	0	+1	1	0	0
Mining								
Manufacturing	+3	0	1	2	+1	0	1	0
Construction	+2	1	2	-1	0	-1	1	0
Electricity, gas and water	+11	2	6	3	+1	3	-1	-1
Transportation and communication	+1	6	-2	-3	+1	0	1	0
Trade	0	2	-2	0	+1	0	1	0
Finance	-1	0	0	-1	+4	9	-5	0
Service								
Community and business	+1	0	1	0	+10	3	4	3
Government	-3	-4	1	0	0	4	-4	0
Recreation	0	0	0	0	+9	9	-1	1
Personal	0	-1	1	0	-9	2	-13	2

CHANGES IN SELECTED VARIABLES

FOOTNOTES

- (1) See above page 1.
- (2) More accurately it is the number of hours of work (assuming the same quality of work) in each occupation which is determined. However, as has already been indicated, this study is confined to the number of persons in each occupation.
- (3) Different kinds of technological changes will have different implications for capital-labour ratios and for occupational structure.
- (4) Dominion Bureau of Statistics, Indexes of Real Domestic Product by Industry of Origin, 1935-61, Queen's Printer, Ottawa, 1963, Foreward.
- (5) ibid. The indexes were applied to the total Gross Domestic Product in 1949, see Appendix B.
- (6) More particularly, the data were adapted from W. Hood and A. Scott, Output, Labour and Capital, Royal Commission on Canada's Economic Prospects, Queen's Printer, Ottawa, 1957.
- (7) As was noted in Chapter 4, we are dealing only with the experienced labour force who indicated either an occupation or an industry. New entrants to the labour force and persons who did not specify an occupation or an industry are not included.
- (8) The unemployment rates were as follows:

1931 - 12.0	1951 - 2.0
1941 - 4.6	1961 - 6.2
- (9) This assumption may not be as unrealistic as it might appear at first glance. Normally, on the basis of diminishing marginal productivity, one would expect output-per-man (average product) to fall as the unemployed are added to each industry. With a cyclical downturn, firms would lay off their least productive workers. However, it has been suggested by Professor W.G. Bowen that output per man might rise as the unemployed are rehired if the firm is retaining employees in which there is a substantial investment, such as managerial and professional employees. These persons would be regarded as fixed overhead.
- (10) Conceptually, structural unemployment results from imbalances between changes in supplies and changes in demands. Structural unemployment is difficult to quantify except in such cases as coal miners in Nova Scotia.

There is a sizeable amount of seasonal unemployment in Canada but in June the figure is at its lowest. See: "Seasonal Unemployment in Canada", The Labour Gazette, Volume 40, No. 5, 1960, Department of Labour, Ottawa, Canada.

Frictional unemployment refers to persons who are between jobs and those who have newly entered the labour force. Many of the persons in this category have been excluded from the labour force in this study.

- (11) The technique of separating the impact on occupational composition of the changes in the variables is a refinement of an earlier approach I used in my paper Factors Determining Occupational Trends in the Canadian Economy, presented at the Thirty-third Annual Meeting of the Canadian Political Science Association, Montreal, June, 1961 (mimeographed). The approach in this paper was based on the work of Gladys L. Palmer and Ann Ratner in their study, Industrial and Occupational Trends in National Employment, Research Report No. 11, Industrial Research Department, Wharton School of Finance and Commerce, University of Pennsylvania, Philadelphia, 1949.

In the earlier method, the sources of change in occupational composition were: employment level changes; industry structure changes (industrial distribution of labour force); and occupational structure changes. The present study retains the occupational structure factor but introduces two other factors: industrial distribution of total output and output-per-man in each industry. The latter two factors combine to determine the level and industrial distribution of employment.

The sum of the impacts of the two new factors will equal the sum of the changes arising from changes in employment level and industry structure.

There is a further modification of the earlier approach in that the computer has enabled me to calculate the six possible ways in which the factors could change. Calculations were made in only one of the possible ways in the earlier studies.

- (12) Appendix C contains data showing the impact on the number of persons in each occupation of changes in: (1) the level of output in each industry; (2) productivity in each industry; (3) occupational structure of each industry. These figures are not included in the analysis since our primary interest is in the changes in the percentage distribution of the labour force among occupations.
- (13) Hood and Scott developed estimates of gross and net stock of capital by industry (showing construction, machinery and equipment) for the Royal Commission on Canada's Economic Prospects, op. cit., Chapter 6, Appendix B. However, the bulk of the data only cover the period 1945 to 1955. I did attempt to extend these data using estimates of Business Gross Capital Formation by Industry, as published in the National Accounts, but the host of problems which I encountered, forced the abandonment of the project.
- (14) It would not have been possible to undertake these calculations without the use of a computer. I want to thank the Industrial Relations Section, Princeton University for financing the programming of these calculations. The Princeton University IBM 7094 computer was used. I would also like to thank the programmer, Mr. Peter Tinsley, for his skill in setting up the material.
- (15) The output of most service industries is measured in terms of constant dollar labour input. Hence, by definition, there should be no change in labour productivity over time. Our figures do show some small changes, probably as a result of using the number of persons employed rather than annual number of manhours to calculate productivity. See discussion below concerning the changes in output-per-man in the personal service industry.
- (16) See above pp. 74.

CHANGES IN SELECTED VARIABLES

- (17) The calculations are shown in Appendix B. The relative price index for the finance industry includes residential rents. We were not able to estimate the value of rents in the portion of Gross Domestic Product originating in the finance industry.
- (18) The same trend in relation prices is obtained if the price index of fully and chiefly manufactured goods is expressed as a percentage of the wholesale price index. See Dominion Bureau of Statistics, Canadian Statistical Review, 1955 Supplement, Ottawa, 1955, pp. 55 and 61.
- (19) The same trend in relative prices is obtained when the price index of Total Canadian Farm Products is expressed as a percentage of the wholesale price index in each census year. These data can be obtained from various issues of the Canadian Statistical Review.
- (20) The final impact will depend on the initial size of the three variables and the amount of change in productivity.
- (21) If productivity were defined as output-per-manhour, then there would be no change since the output of community and business service sector is measured by constant dollar labour input. Our productivity figures refer to output-per-man and were derived by dividing total output by the employment in June of each census year. On this basis, there would likely be small differences between the two approaches.
- (22) Between 1941 and 1951, the labour force in the personal service sector declined from 368,000 to 314,000. Within this sector, the only significant decrease was in private households or domestic service which dropped by over 100,000 persons. If the number of annual hours of work of persons in domestic service was significantly lower than the hours of work in the other personal service industries, then the change in the composition of the personal service industry would increase output-per-man even though output-per-manhour was unchanged.
- (23) Cyclical fluctuations might also affect productivity but we have assumed in this study that output per person is not affected by the level of output in an industry. See above pp. 74.
- (24) In his study of productivity trends, John Kendrick assumed that differences in average hourly earnings among occupations roughly reflect the different contributions of various occupations to product. On this basis, he attempted to estimate and weight manhours separately for each occupation. As a result of data limitations, Professor Kendrick was forced to use industry average hourly compensation estimates as weights. "The aggregate of industry real labour input so computed will approximate the results by weighing manhours worked by occupation so long as the occupation structures of the various industries are relatively stable." John Kendrick, Productivity Trends in the United States, Princeton University Press, Princeton, 1961, pp. 32-33, my underlining.

On the basis of the amount of change in the occupational structures of the various industries in Canada, we wonder whether Professor Kendrick's assumption of "relatively stable" occupation structures is valid.

Conclusions

The purpose of this study was to undertake an empirical analysis of the changes which occurred in the occupational composition of the Canadian labour force between 1931 and 1961. Occupational composition was defined as the percentage distribution of the labour force among occupations. To phrase this another way, the objective of the study was to find out why there was a change in the proportion of the total labour force in different occupations.

This final chapter contains three sections. In the first section, the findings of the study are summarized. The second section presents the implications of the research for manpower forecasting. The third section indicates some areas where further research is needed.

Summary of Findings

In summarizing the results of this study, we will only present the major findings. The assumptions and the methods which underly the analysis will not be repeated here. However, reference will be made to the relevant sections in the preceding text.

There were some basic changes in the occupational composition of the Canadian labour force over the period, 1931 to 1961. Clerical, professional and manufacturing and construction occupations made large gains, while agricultural workers and labourers showed significant declines.⁽¹⁾ Aside from manufacturing and construction occupations, the changes in the proportion of the labour force were continuous over time. For the manufacturing and construction group, there was an increase up to 1951 then a decline.

Two approaches were adopted in analyzing the reasons for these changes.⁽²⁾ The first is a general analysis dealing with

each occupation as if there were a national market for persons to perform each type of work. The second approach is more specific. The changes in occupational composition are broken down by measuring the contribution of each of three variables to the total change.

The Demand-Supply Analysis

The objective of the first or general type of analysis was to determine whether a shift in the demand curve for persons to perform each occupation was the dominant factor; or whether the dominant factor was a shift in the supply curve. There was also the further question of the direction of the shifts in these curves. The method was based on the simple demand-supply analysis. However, it should be noted that both the demand and supply curves were defined in relative terms, that is, the two variables were: relative earnings in an occupation; and proportion of the total labour force in the occupation.⁽³⁾

It was found that the increase in supply of persons to clerical occupations was the dominant factor in each decade of the period. In the case of manufacturing and construction occupations, demand changes were dominant. Between 1931 and 1951, demand increased⁽⁴⁾ while in the 1951-61 decade, demand decreased.

For professional occupations, increases in supply were dominant from 1931 to 1951. In the last decade, however, the growth in demand was the most important factor. In the period when there was the largest reduction in the proportion of labourers i.e. between 1931 and 1941, the reduction in supply was the dominant change. In the following two decades, demand changes were dominant.

For agricultural workers there was a different combination of shifts in each decade. Between 1931 and 1951, the decrease in supply was the dominant factor. In the final period, the declines in demand and supply were equal.

Changes in Education Levels and Female Participation in the Labour Force

The general type of analysis was also used to examine the impact of changes in: (1) the education level of persons in the labour force; and (2) female participation of certain occupations.

To begin with, changes in the supply curve of professional occupations were looked at in relation to the changes in the level of education of persons in the labour force. It was found that up to 1951 the increase in the number of persons in the labour force with higher levels of education (defined as thirteen or more years of schooling), was more than sufficient to meet the needs of expansion

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in the professional group. However, in spite of the large increase in the number of persons in the labour force with higher levels of education between 1951 and 1961, the increase in demand for professionals outran the increase in supply. In this last decade, there was a tremendous increase in the demand for professionals at the same time as there was an increase in the demand by other occupations (especially managerial and clerical) for persons with higher levels of education.

Changes in the supply curves of clerical and service occupations were examined in the light of the substantial increase in female participation in the labour force. This relationship was studied because women outnumber men in clerical and service occupations. It was concluded that the increase in female participation in the labour force permitted the increase in demand for clerical workers to raise the number (especially of women) employed in this occupation without raising relative earnings. Part of the growth in the supply of women to clerical occupations was also at the expense of service occupations. The proportion of women in the service group declined.

These past developments in the female labour force give rise to two questions: (1) will the female labour force continue to grow faster than the male labour force; and (2) will a high proportion of the female labour force continue to be concentrated in clerical occupations? The consensus seems to be that the answer to the first question is "yes". Most projections show a continued increase in the female labour force participation rate.⁽⁵⁾ It is not possible, a priori to answer the second question. As has been shown in this dissertation, a variety of factors are responsible for the occupational distribution of the female labour force and each one would have to be examined before a final estimate could be made. This is beyond the scope of this study. In a later section of this chapter there is a brief look at some of the necessary steps in projecting future occupational composition.

The Impact on Occupational Composition of Changes in Selected Variables

A second type of analysis was undertaken in an attempt to get at some of the more specific factors which were responsible for changes in occupational composition. Accordingly, the impacts of changes in each of the following variables were measured: (1) industrial distribution of total output; (2) productivity in each industry; and (3) occupational structure of each industry.⁽⁶⁾

It was found that the major results of shifts in the industrial distribution of total output were increases in the proportion of manufacturing and construction occupations, and decreases in agricultural workers. The increases in white-collar occupations

arising from output shifts were less than the gains produced by the changes in the other variables.

The major shifts in output, comparing the 1931 and 1961 distribution, were the increase in the manufacturing industry and the decrease in agriculture. The large shift in output to manufacturing occurred between 1931 and 1941 while the shift away from agriculture was continuous over the three decades.

Productivity changes had the greatest impact on white-collar occupations in general and on professional and commercial and financial occupations in particular.⁽⁷⁾ Offsetting these increases were declines in agricultural and manufacturing and construction occupations.

Occupational structure changes were responsible for all of the decrease in the proportion of labourers and half of the increase in clerical workers. In addition, occupational structure changes contributed to the increase in manufacturing and construction occupations.

The changes in each of the variables were also examined. Changes in the productivity of each industry and changes in the occupational structure of each industry were presented for the entire 1931 to 1961 period as well as decade by decade. These changes were related to the impact that each of the variables had on the occupational composition of the labour force.

In the case of the industrial distribution of total output, the question was asked whether the changes resulted from changes in demand or changes in the relative prices of products.⁽⁸⁾ It seems likely that an increase in demand was responsible for the shift in the distribution of total output toward the manufacturing sector between 1931 and 1941. However, since relative prices in the manufacturing sector declined over this decade, it was not possible to distinguish between shifts in the demand curve and movements along a demand curve.⁽⁹⁾ After 1941, the shift in output away from manufacturing resulted from a decline in demand.

Between 1931 and 1951, relative prices in the agriculture sector rose. The decline in the proportion of total output originating in agriculture may have come either from a decrease in demand or as a result of the price changes. In the decade 1951 to 1961, both relative prices and proportion of output in agriculture declined. In this latter period it is clear that there was a reduction in demand.

The Relationship Between the General Approach and the Analysis of the Impact of Selected Variables

The general approach to the changes in occupational composition dealt with shifts in the demand and supply schedules for each occupation treated as a factor of production. The analysis of

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the impact of selected variables breaks down the results of changes occurring in both the product and factor markets.

Theoretically, the changes in relative prices of occupations could affect both the occupational structure and the productivity of each industry. The final impact would depend on the production function in each industry and the relative prices of other (non-labour) factors of production. Unfortunately, we don't know the production functions of each industry and hence it is not possible to measure the impact of changes in relative earnings of occupations.

There is one interesting observation which will be mentioned in connection with the relationship between the two types of analysis which were conducted in this study. In the case of clerical workers it was observed that supply increases were dominant in each decade. As a result, relative earnings of clerical workers declined continuously. It was also observed that changes in the occupational structure of industries produced half the increase in the proportion of clerical workers in the labour force. It is possible that the decline in relative earnings of clerical workers led to some substitution of this occupation for other groups of workers. In the absence of any knowledge of production functions there is no way of determining to what extent the occupational structure change was the result of: (1) substitution induced by relative price changes; or (2) changes in technology.

Implications of the Research for Manpower Forecasting

Many countries have undertaken forecasts of the future needs of their economy for persons with various kinds of training. This information is used by persons undertaking educational planning and also is important in some countries for immigration policies.⁽¹⁰⁾

A variety of techniques are used to project the future needs depending on: (1) the quality and type of the statistical data which was available; (2) the use to which the results will be put; and (3) the size of the budget and the time allotted to the forecasting unit. The forecasts proceed by estimating future employment in each occupation. In most cases, the basic variables are: (1) the total output of the economy and its distribution among industries; (2) productivity in each industry sector; and (3) the occupational structure of each industry.⁽¹¹⁾ There are many different approaches for obtaining figures for the variables, however, these cannot be discussed here.

Two major criticisms have been levelled at manpower projections.

A major problem is that neither individual employers nor professional investigators are able to foresee the implications of new scientific developments. A second problem

is that the manpower projections I know about have not succeeded in taking account of the elasticity of substitution between capital and labour and between highly-trained manpower and less-highly trained manpower. There are few, if any, products that can be produced by only one specific combination of manpower, materials, and machinery, and as the relative scarcity of the various factors changes, one would expect adjustments in factor proportions to follow.⁽¹²⁾

In the comments that follow, we take it as given that manpower forecasts will continue to be made. The question to be answered is whether the research in this dissertation can contribute anything to the techniques of projecting manpower requirements. The discussion will be directed toward the second problem area which Professor Bowen has raised. I recognize the difficulties of estimating the impact of new scientific developments but this is beyond the scope of my analysis.

It was originally contemplated that estimates of capital stock by industry sector would be included in the analysis. Regretfully, as was noted earlier, it was not possible to develop such data.⁽¹³⁾ Although changes in capital-labour ratios affect labour productivity, so do technological changes and I cannot separate the two. I will concentrate on the question of substitution between different types of labour.

Presumably, substitution between different types of labour will occur when changes in relative scarcity affects the relative prices of a certain type of labour. Although most forecasting studies estimate both demand (projected requirements) and supply (available human resources) none of the studies that I know include the prices (earnings) of the labour factors. On the basis of our research, an approach can be made toward resolving this problem. In the final analysis, knowledge of the production function of each industry together with relative factor prices is needed.

I would suggest that manpower projections be conducted in two stages. The first step would be the familiar approach of estimating, (or divining): (1) total output and its industrial distribution; (2) labour productivity in each industry; and (3) occupational structure in each industry. On this basis, a first approximation of the occupational composition of the labour force at a future point in time would be made.

The second stage would be to set up a table similar to Table 9 in Chapter 5 (page 43). This table shows the relative earnings and the proportion of the labour force in each occupation at different points in time. Of course in our forecasting model we would only be able to include at first the present relative earnings structure along with both the present and future occupational composition. In doing any forecasting, some estimates would be made

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of future supplies or, at least, the number of persons at different education and skill levels. For example, one crude approach would be to use median years of schooling as a measure of the education requirement to perform an occupation. On the basis of the potential number of persons able to perform different occupations, it should be possible to make some (even rough) assessment of the likely trend in relative earnings in each occupation group.

Having obtained a first approximation of relative earnings in each occupation of the target date, the next step is to examine the occupational structure of each industry to see whether the changes in relative earnings will have any impact.⁽¹⁴⁾ This will require making some estimates of the elasticities of substitution between different occupations in each industry. Although this hasn't been done before, it is necessary to at least consider the problem in this context and make some rough approximations. The fact that this can be important was noted above where the impact of occupational structure changes on clerical workers was discussed.⁽¹⁵⁾ As a result of this examination, it may be necessary to revise the estimates of the projected occupational structure of each industry.

The final step would be to use the revised occupational structure figures together with the output and productivity estimates to prepare a final projection of the future occupational composition of the labour force.

The objective in preparing a manpower forecast is not the same as in betting on a horse race. The idea is not simply to put away the projection and then, after the event, find out if you were right. Rather, the purpose is to see what shortages or surpluses are likely to develop in the future and, on this basis, what policies should be undertaken now. At the same time, it should be recognized that there are dangers in making the "wrong" decision.⁽¹⁶⁾ However, if the projections are going to be undertaken anyway, then perhaps our two-stage approach will make some contribution to reducing the problems associated with this endeavour.

Areas Where Further Research is Needed

There are several areas in the study of changes in occupational composition in which further research is needed. To begin with, there are the two points which were made at the outset.⁽¹⁷⁾ This study only dealt with major occupation groups. It would be desirable to carry this research framework further and deal with specific occupations. Secondly, the study was conducted in terms of the persons rather than manhours. It would be interesting to determine how hours of work would alter the results of the analysis.

In addition to these points, there are two other areas where further research is needed:

(1) Some study would be useful concerning the degree of association between the three selected variables or any pair of these variables for each industry.⁽¹⁸⁾ There were not sufficient number of observations to permit such analysis here.

(2) It would be desirable if some research were done on the nature of the production functions (in the theoretical sense) of various industries. This would include both the questions of the substitution between capital and labour and the substitution between different types of occupations.

Concluding Comment

This research has attempted to shed some light on the reasons for the change in the occupational composition of the Canadian labour force between 1931 and 1961. Although the analysis did not answer all the questions, it is hoped that a useful start was made in this direction.

CONCLUSIONS

FOOTNOTES

- (1) The occupation groups are described in Chapter 3.
- (2) The framework for the analysis is set out in Chapter 2 along with the relationship to the theory of the determination of employment in an occupation.
- (3) See above Chapter 5.
- (4) In the decade 1931 to 1941, both demand and supply increased to the same extent. In the next decade, the increase in demand was dominant.
- (5) See: Wm. C. Hood and Anthony Scott, Output, Labour and Capital in the Canadian Economy, Royal Commission on Canada's Economic Prospects, Ottawa, 1957, pp. 182-186.
Richard E. Caves and Richard H. Holton, The Canadian Economy, Prospect and Retrospect, Harvard University Press, Cambridge, Massachusetts, 1959, pp. 280-286.
In both these studies, female participation rates in the United States have been used as a guide to the likely direction of future change. At present, for the age groups 25-44 and 45-64, the United States rate is considerably higher than Canada. ibid., p. 284.
- (6) The method used to measure the impacts of changes in these variables is outlined in the third section of Chapter 7 above.
- (7) The process by which productivity changes affect occupational composition is outlined on p. 81.
- (8) This discussion is contained on pp. 84-87.
- (9) As in the earlier discussion, demand curves are defined in relative terms.
- (10) This would also include situations where emigration is a consideration.
- (11) For example, see: Herbert S. Parnes, Forecasting Educational Needs for Economic and Social Development, Organization for Economic Cooperation and Development, 1962, Chapter II.
- (12) William G. Bowen, Economic Aspects of Education, Industrial Relations Section, Princeton University, Princeton, 1964, p. 35.
See also: Frederick Harbison and Charles A. Myers, Education, Manpower, and Economic Growth, McGraw-Hill Book Company, Toronto, 1964, "Procedures for Estimating Future Requirements", pp. 195-202.
- (13) See above p. 75.
- (14) It would be valuable to examine, in addition, whether there would be any change in the projected output-per-employee (or per manhour) figure for the industry's entire work force.

OCCUPATIONAL COMPOSITION

- (15) See above pp. 106-107.
- (16) See Bowen, Economics of Education, p. 36.
- (17) See above pp. 1.
- (18) The three variables are, of course: industrial distribution of total output; productivity in each industry; occupational structure of each industry.

Appendix A

Labour Force and Employment Data

Labour Force Data-Industry By Occupation

I originally prepared labour force figures, industry by occupation for 1931, 1941 and 1951, as part of my research for the Economics and Research Branch, Department of Labour, Ottawa, Canada.⁽¹⁾ The data were derived from the decennial census⁽²⁾ and were adjusted to the 1951 classification basis for industry and occupation. The guidelines for these adjustments came from special conversion tables prepared by Miss A. G. Wood, head of the Occupations and Employment Section, Census Division, Dominion Bureau of Statistics.

Miss Wood's section also provided me with industry by occupation figures from the 1961 census. I adjusted these figures to the 1951 classification basis using guidelines provided by Miss Wood. Unfortunately some of these adjustments are only approximate since the 1961 industry by occupation data were only available in terms of major groupings and not by detailed industries and occupations. As a result, certain distributions had to be estimated using knowledge of the earlier industry by occupation matrices. I received some assistance in this connection from Mr. W. A. Nesbitt, Chief, Processing and Analysis Section, Special Surveys Division, Dominion Bureau of Statistics.

Two additional adjustments were made to prepare the labour force data for use in this dissertation:

(1) The industry, Dominion Post Office was transferred from government service to the transportation, storage and communication industry. This was done so that the labour force figures would conform with the industrial classification basis used for the published estimates of real domestic product by industry of origin.

(2) Labour force figures in the industry group not stated were prorated among other industries. This was done because there was no comparable output figure for this sector. The alternative would have been to omit these persons, which would have led to certain distortions in numbers of persons in particular occupations.

The number of persons in each occupation within industry not stated were prorated according to the occupation's distribution among the other industries. Figures for the occupation group not stated were similarly prorated.

There was a residual group, industry and occupation not stated, for which there was no reasonable basis for proration. It was decided to remove this group from the labour force. The numbers in this category are shown in Table 4 of Chapter 4.

Tables A-1, A-2, A-3 and A-4 show the labour force industry by occupation figures for the years 1961, 1951, 1941 and 1931 respectively.

Employment Data By Industry

Table A-5 shows the labour force and employment figures by industry. The employment figures were derived by subtracting the number unemployed at each census date from the labour force.

The unemployment data for 1931, 1941 and 1951 were obtained from the decennial censuses⁽³⁾ and adjusted to the 1951 industrial classification. It was necessary that the not stated group be prorated among the other industries. The method of proration was to apply the unemployment rate in the not stated industry to the results of proration calculations made for the labour force figures. At the time these figures were prepared, the unemployment figures from the 1961 census had not been released. Rates of unemployment in each industry were derived from estimates prepared in connection with the monthly survey of the labour force.⁽⁴⁾ The estimates were available for each quarter of 1961. It was decided to average the second and third quarter figures to get a measure which would approximate a June figure.

Unemployment rates were published for three individual industries: manufacturing, construction, and trade. In these cases the unemployment rates were applied to the labour force estimates for each industry which were derived above.

The remaining unemployment rate figures were published only for groups of industries. In this category were the primary industries (agriculture, forestry, fishing and mining); service industries (finance, community and business, government, recreation and personal). In addition, the figure for transportation included public utilities.

It was found that the distribution of the total unemployed in the service industries among the various sectors was very similar in the years 1931, 1941 and 1951. Accordingly, the distributions in these years were averaged and the results were applied to the total unemployment in these service industries in 1961. This same approach was used to separate estimates for unemployment in transportation and public utilities.

This method could not be used to distribute the unemployment figure for primary industries. The fluctuations in each sector's

share of the total primary unemployment were too erratic. In place of this approach, several other sources of data were used. To begin with, the June employment figure based on the labour force survey was used for forestry and fishing occupations. In the light of the labour force figures based on the census, this seemed to be the only primary industry figure which was reasonable. The agricultural employment figure was too high (greater than the labour force figure) and the mining estimate was too low. The figure for the latter was 75,000 in June compared with a labour force total in the industry of 119,000. This would have meant an unemployment rate of 37 per cent.

Employment in the mining industry was calculated using employment indexes derived from a monthly establishment survey of employment and payrolls as published in various issues of the Canadian Statistical Review.⁽⁵⁾ Employment indexes for mining for June of 1951 and 1952 were available on a base of 1939=100. The year 1952 was the first for which monthly estimates were available on the base 1949=100. The ratio of the mining index in June 1951 over that of June 1952, on base 1939=100, was used to estimate the index for June 1951 on a base 1949=100. The resulting index was then divided into the index for June 1961. This provided an index for 1961 on a base 1951=100. This index in turn was applied to the 1951 employment figure for mining as derived from the census to produce an estimate of employment in the mining industry in June, 1961. Unemployment in the industry was obtained by subtracting the employment figure from the labour force total for the industry.

Unemployment in the agriculture industry was calculated by subtracting the unemployment figures for forestry and fishing and mining from the total primary unemployment determined by the unemployment rate and the labour force figure.

Other Labour Force Data

Four other breakdowns of the labour force were prepared: (1) occupation group by sex by earnings; (2) occupation group by sex by years of schooling; (3) occupation by sex by average number of weeks worked by occupation. As with the earlier occupation data, the figures had to be adjusted to the 1951 classification basis. For the first two sets of data, the long and tedious task of adjustment was done by Miss Louise Woods of the Economics and Research Branch, Department of Labour, Canada. I prepared the third set of figures myself.

These data were prepared as part of a series of studies on occupational trends which I have been conducting for the Economics and Research Branch, Department of Labour. The program is under the direct supervision of Mr. Phillip Cohen. Miss Louise Woods has been assisting me in the preparation of the data. The first publication in the series was the study: Occupational Trends in Canada, 1931-1961.⁽⁶⁾

TABLE A-1
LABOUR FORCE, JUNE 1961, NUMERICAL DISTRIBUTION, INDUSTRY BY OCCUPATION, FOR CANADA
(Thousands)

	All Occupations	Managerial	Professional	Clerical	Commercial Financial	Manufacturing Construction	Labourers	Transportation Communication	Service	Agricultural	Logging Fishing	Mining
All Industries	6210.3	504.0	637.8	824.6	495.4	1382.5	345.9	500.2	687.4	649.9	117.4	65.2
Agriculture	640.4	1.8	1.5	1.5	1.7	2.1	1.5	1.6	1.2	627.1	.4	.0
Forestry	143.6	4.9	2.3	2.8	.1	12.8	4.7	6.5	5.2	.7	103.2	.1
Fishing	119.3	4.2	9.3	8.1	.6	28.0	3.8	4.4	2.9	.1	.1	57.9
Manufacturing	1494.7	91.1	76.5	181.1	96.9	806.7	130.2	73.9	25.4	1.4	8.5	3.0
Construction	468.4	38.6	7.3	16.1	2.0	308.7	70.9	17.9	3.6	.3	.2	2.9
Electricity, gas and water	70.5	4.1	7.0	14.5	1.1	19.9	7.6	13.5	2.3	.4	.1	.2
Transportation and communication	500.2	24.4	21.5	88.3	10.3	22.3	33.6	279.9	18.6	.5	.2	.6
Trade	931.8	214.0	15.3	166.0	312.5	91.3	45.9	65.4	18.9	1.4	.9	.2
Finance	229.7	29.5	7.8	120.2	53.3	3.1	.4	2.7	12.6	.1	.0	.0
Service	764.4	5.2	436.0	98.1	7.7	21.6	6.8	9.4	176.0	3.3	.0	.1
Community and business	363.3	30.6	45.4	106.6	2.6	48.3	33.6	16.0	72.0	7.1	.9	.3
Government	39.8	7.2	2.7	4.7	1.5	2.0	1.3	.3	16.0	3.1	1.0	.0
Recreation	444.4	48.3	5.3	16.6	4.8	16.0	5.7	8.8	332.8	4.2	2.1	.0
Personal												

TABLE A-2
LABOUR FORCE, JUNE 1951, NUMERICAL DISTRIBUTION, INDUSTRY BY OCCUPATION, FOR CANADA
(Thousands)

	All Occupations											
	Managerial	Professional	Clerical	Commercial	Manufacturing	Construction	Labourers	Transportation	Service	Agricultural	Logging	Mining
All Industries	5157.7	386.2	564.2	349.5	1201.6	351.7	414.1	446.7	830.5	154.6	65.5	
	827.2	1.5	1.5	1.2	1.5	1.1	1.4	1.8	816.6	.7	.0	
	180.6	1.7	3.1	.4	8.5	3.7	8.9	7.0	.7	141.6	.1	
	103.9	5.4	4.3	.6	18.0	4.2	4.1	2.4	.1	.1	62.0	
Manufacturing	1364.7	46.9	150.6	66.0	782.8	167.5	43.9	24.3	1.1	8.7	1.2	
	352.4	5.8	11.1	1.4	213.7	74.4	17.6	3.6	.2	.2	1.8	
	62.0	4.5	9.8	.8	17.5	13.6	10.1	2.7	.2	.2	.1	
Transportation and communication	433.5	7.2	61.3	7.6	30.4	30.7	257.6	15.5	.3	.1	.1	
	711.3	12.9	117.9	226.8	77.9	29.5	50.4	13.7	1.3	.9	.0	
	144.2	6.6	76.0	33.0	1.9	.4	2.2	7.9	.1	.0	.0	
Service	431.2	267.0	43.7	4.5	17.8	4.9	4.1	85.5	2.7	.1	.0	
	203.5	20.0	69.3	2.5	23.1	14.6	8.0	40.9	2.8	.4	.1	
	28.7	2.2	3.6	1.0	1.2	1.2	.3	11.1	1.3	.2	-	
	314.4	4.5	12.3	3.7	7.3	5.9	5.7	230.2	3.2	1.6	-	

TABLE A-3
LABOUR FORCE, JUNE 1941, NUMERICAL DISTRIBUTION, INDUSTRY BY OCCUPATION, FOR CANADA
(Thousands)

	All Occupations	Managerial	Professional	Clerical	Commercial	Manufacturing	Labourers	Transportation	Service	Agricultural	Logging	Fishing	Mining
All Industries	4188.0	225.6	282.3	304.1	247.4	871.0	266.0	267.1	439.8	1083.8	130.3	70.5	
Agriculture	1082.3	.1	.5	.4	.2	.3	.4	.9	.2	1079.4	.0	.0	
Forestry	145.0	1.5	.6	1.2	.1	4.2	1.1	5.0	4.0	.1	127.1	.0	
Fishing	93.3	1.4	3.1	2.0	.1	11.7	1.8	1.5	2.0	.0	.0	69.8	
Mining													
Manufacturing	983.9	28.2	28.4	86.4	32.1	633.1	142.4	19.8	11.9	.2	1.3	.0	
Construction	226.0	6.8	4.2	3.3	.1	148.4	55.4	6.0	1.1	.0	.0	.6	
Electricity, gas and water	25.9	1.0	2.3	3.7	1.0	10.5	3.5	2.7	1.3	.0	.0	.0	
Transportation and communication	292.3	12.3	5.4	35.8	5.8	17.3	26.4	179.3	9.9	.1	.0	.0	
Trade	468.3	128.9	10.6	63.5	175.7	29.9	15.0	40.9	3.7	.2	.0	.0	
Finance	90.4	8.4	6.0	40.9	23.5	.9	.2	1.4	9.3	.0	-	-	
Service	277.7	.7	201.8	17.9	2.9	5.8	1.7	1.1	44.9	.7	.0	.0	
Community and business	117.2	11.8	12.4	39.3	1.6	5.6	13.0	3.8	28.2	1.1	.4	.0	
Government	17.7	3.4	2.8	2.0	.3	.3	1.6	.1	7.0	.1	.0	-	
Recreation	367.9	21.3	4.2	7.7	4.0	3.0	3.7	4.6	316.2	1.8	1.3	.0	
Personal													

TABLE A-4
LABOUR FORCE, JUNE 1931, NUMERICAL DISTRIBUTION, INDUSTRY BY OCCUPATION, FOR CANADA
(Thousands)

	All Occupations	Managerial	Professional	Clerical	Commercial	Manufacturing	Labourers	Transportation	Service	Agricultural	Logging	Mining
All Industries	3917.1	219.8	238.1	260.8	239.8	636.4	441.9	245.9	359.6	1127.7	89.8	57.3
Agriculture	1124.0	-	.3	.3	.2	.3	.1	.5	.3	1121.9	.0	.0
Forestry	97.5	1.9	.4	.5	.0	2.1	.3	1.3	3.0	.1	87.9	.0
Fishing	71.8	1.2	1.7	1.3	.1	7.8	1.0	1.4	1.0	.0	.1	56.3
Mining												
Manufacturing	800.0	37.2	16.3	62.0	38.9	418.9	202.2	16.1	7.0	.1	1.0	.1
Construction	293.5	12.8	3.5	3.6	.2	144.8	119.8	5.8	2.0	.1	.0	.9
Electricity, gas and water	28.1	1.0	2.1	3.7	1.2	9.6	7.5	2.3	.7	.0	.0	.0
Transportation and communication	317.0	15.2	4.4	39.2	6.8	14.6	54.1	174.3	8.2	.1	.0	.0
Trade	395.6	112.2	4.7	49.8	155.4	24.7	17.6	28.0	3.1	.1	.0	.0
Finance	93.1	8.5	3.4	48.7	28.8	.3	.1	1.8	1.3	.0	.0	.0
Service												
Community and business	251.4	.5	187.3	17.4	3.4	4.8	3.1	1.1	32.8	1.0	.0	.0
Government	100.8	5.6	7.6	25.7	1.4	5.0	27.3	7.2	19.9	1.0	.2	.0
Recreation	18.8	4.6	2.7	1.6	.3	.4	3.1	.2	5.8	.1	.1	.0
Personal	325.6	18.9	3.7	6.9	3.0	3.0	5.6	6.0	274.7	3.1	.6	.0

TABLE A-5
LABOUR FORCE AND EMPLOYMENT BY INDUSTRY GROUP, 1931 - 1961

	1931		1941		1951		1961	
	Labour Force	Employed	Labour Force	Employed	Labour Force	Employed	Labour Force	Employed
All Industries	3917.1	3447.5	4188.0	3997.5	5157.7	5109.9	6210.3	5863.9
Agriculture								
Forestry	1124.0	1093.2	1082.3	1068.2	827.2	825.3	640.4	617.2
Fishing	97.5	76.0	145.0	131.9	180.6	175.6	143.6	122.0
Mining	71.8	49.8	93.3	83.9	103.9	102.8	119.3	112.2
Manufacturing								
Construction	800.0	645.1	983.9	934.8	1364.7	1351.2	1494.7	1407.3
Electricity, gas and water	293.5	198.3	226.0	198.2	352.4	344.3	468.4	394.2
	28.1	24.1	25.9	25.0	62.0	61.4	70.5	67.9
Transportation and communication								
Trade	317.0	269.8	292.3	276.7	433.5	429.4	500.2	473.4
Finance	395.6	360.2	468.3	449.5	711.3	705.5	931.8	891.7
	93.1	87.4	90.4	87.3	144.2	143.7	229.7	224.6
Service								
Community and business	251.4	241.4	277.7	267.2	431.2	429.5	764.4	751.1
Government	100.8	87.0	117.2	112.1	203.5	202.1	363.3	351.9
Recreation	18.8	16.3	17.7	16.4	28.7	28.3	39.8	37.2
Personal	325.6	298.9	367.9	346.2	314.4	310.6	444.4	413.3
Persons with Industry and occupations not stated (including never worked before)	.5	.2	8.0	6.2	57.2	13.6	132.0	88.4
Total Civilian Labour Force	3917.6	3447.7	4196.0	4003.7	5214.9	5123.5	6342.3	5952.2
Armed Forces	4.2		314.6		71.2		115.9	

Appendix B

Output Data

Estimates of Real Domestic Product by Industry of Origin, 1931-1961

(a) 1941-1961

I am indebted to Mr. Gordon J. Garston, chief of the Industrial Output Section, National Accounts and Balance of Payments Division, Dominion Bureau of Statistics for suggesting the approach that was used to prepare the output data.

It was decided to use estimates of real domestic product by industry of origin in constant (1949) dollars as the measure of output. Real domestic product is a quantity measure of the unduplicated production of individual industries (and the domestic economy when summed). Two publications by the Dominion Bureau of Statistics provided the basis for preparing the estimates for the period 1941-1961:

Indexes of Real Domestic Product by Industry of Origin, 1935-1961, Ottawa, 1963 (Indexes) National Accounts, Income and Expenditure, 1926-1956, Ottawa, 1962. (National Accounts)

The method of preparation required two steps. The first step was to obtain output figures for each industry for the year 1949. This was done by applying the 1949 industry weights as published in Indexes (pages 67-70) to the figure for Gross Domestic Product at Factor Cost in 1949 (\$14,885 million) as contained in Table 4 of National Accounts, page 35.

The second step was to apply indexes for the years 1941, 1951 and 1961 (1949=100) to the 1949 figures. The appropriate indexes are found on pages 67-70 of Indexes. Several adjustments were required to put the output data on a comparable classification basis to the labour force statistics.

(1) Contract drilling (excluding drilling for oil and gas) was removed from the sector, other goods industries, n.e.c., and added to the mining industry.

It can be seen from the description of annual or benchmark indexes, as given in Appendix B of Indexes that contract

drilling belongs in the mining industry as defined in the Standard Industrial Classification Manual. (7).

(2) Manufacturing repair service was added to the manufacturing industry and removed from the sector other goods industries, n.e.c.

The reason for this shift is similar to that of contract drilling. (See Indexes, Appendix B, pages 107 and 112.)

(3) Municipal water works was removed from the sector, other goods industries, n.e.c., and added to electric power and gas utilities for the same reason as noted above. (See Indexes, page 112).

(4) Rents were removed from the industry, finance, insurance and real estate, and placed outside the output table.

Rents were treated in this manner because there is no comparable employment figure. Rents are defined in the description of the output indexes as "All paid and imputed rents on residential property as well as commercial rents received by persons and imputed rents on government owned buildings....."(8)

(5) The output of the public administration and defence sector excludes salaries of the armed forces. Since armed forces personnel were eliminated from the labour force figures, it was also necessary to make a comparable reduction in the output data.

The description of the series Defence Service (armed forces only), indicates that the volume measure was based on labour input. The data were adjusted for shifts in rank and trade group structure. The indexes for the armed forces quantity measure were provided by Mr. Garston. The indexes (1949=100) are:

1961	273.8
1951	168.9
1941	641.1
1931	10.2

The 1949 figure was calculated by the method described earlier.

(b) 1931

Since most of the Indexes of Real Domestic Product only go back to 1935, (9) another source had to be used to estimate output in 1931. Mr. Garston suggested drawing on figures from Professors Hood and Scott's study for the Royal Commission on Canada's Economic Prospects. (10) Chapter 5, Appendix F, of Output, contains annual figures for Gross Domestic Product by industrial sectors from 1926 to 1955.

It was decided to convert the Hood and Scott figures for the year 1931 into indexes using their 1949 figures as equal to 100. These indexes were then applied to the 1949 Gross Domestic Product by industry of origin derived in the previous section.

The following indexes were derived from Hood and Scott data for 1931: agriculture; forestry, fishing and trapping; construction; transportation, storage and communication; trade; finance, insurance, real estate. In two sectors, (agriculture and transportation), it was not possible to prepare an index excluding own-account construction and non-residential rent. In these cases⁽¹¹⁾ it was assumed that the own-account construction and non-residential rent indexes followed the same pattern as the industry's output index.

Other adjustments to derive the 1931 data were:

(1) Postal service was transferred from government to transportation by the following steps:

(i) a figure for output of postal service in 1931 was prepared using an index provided by D. B. S.

$$1931=62.5 \text{ (1949=100)}$$

(ii) This figure was subtracted from the figure for government including postal service and added to transportation.

(2) Armed forces quantity measure for 1931 was also provided by D. B. S.

$$1931=10.2 \text{ (1949=100)}$$

This too was subtracted from government.

(3) The output per employed person figures in the various sectors of the service industry in 1941 were used as the basis for the 1931 service industry estimates. This produced a total output figure for the service industry reasonably close to that estimated by Hood and Scott. Multiplying output per employed persons times total employment in each sector gives the following output figures:

		Millions of 1949 dollars
Community and business service		526
Government		219
Recreation		46
Personal		389
Hood and Scott Indexes:		Millions of 1949 dollars
Community and government		754
Less armed forces	13	
Post office	<u>41</u>	<u>54</u>
		700
Business, recreation and personal		<u>558</u>
		1,258

It may be wondered why this approach was taken rather than one of the other possible ways of using the Hood and Scott data. For example, why weren't the actual 1931 figures used? In deriving their own estimates, Hood and Scott first prepared figures for 1949. These were adapted from the input-output model which had just been prepared by D. B. S.⁽¹²⁾. Indexes (1949=100) were then developed for each industry and applied to the 1949 values.

The 1949 values, however, differ in some significant respects from the 1949 figures which were prepared later in deriving the real output weights for that year as published in Indexes. It was decided to utilize the Hood and Scott indexes but not their base weight figures.

Secondly, I decided not to try to splice the two series together for the overlapping years (1941 and 1951) or any combination of years. I feel that the indexes of Real Domestic Product are the best measure of output available at this time and thus the objective is to extend these back to 1931 by the most accurate methods possible. Since it was also possible to obtain three output series which can be carried back to 1931 (manufacturing, mining, electricity and gas utilities) this was a further reason not to alter the real domestic product indexes.

Table 24 of Chapter 7 shows real domestic product per employed person by industry of origin. This table was prepared by dividing the output figures for each industry by the employment figures derived in Appendix A.

Table 22 of Chapter 7 contains estimates of full-employment real domestic product by industry of origin. The method of calculating these figures is explained in the text accompanying the table.

Method of Estimating Price Indices for Each Industry Sector

Crude price indices for each industry sector were calculated by dividing Gross Domestic Product at Factor Cost (current dollars) by Real Domestic Product (1949 dollars). The figures are shown in Table B-1. The ratio of $\frac{\text{GDP}}{\text{RDP}}$ was then converted into an index form as shown in Table 23 of Chapter 7.

Percentage Distribution of Gross Domestic Product at Factor Cost by Industry (current dollars)

Table B-2 shows the percentage distribution of Gross Domestic Product at Factor Cost by Industry (current dollars).

TABLE B-1

	Gross Domestic Product at Factor Cost Millions of Current Dollars				Real Domestic Product Millions of 1949 Dollars				GDP RDP			
	1931	1941	1951	1961	1931	1941	1951	1961	1931	1941	1951	1961
All Industries	4,310	7,424	19,126	32,837	7,602	11,997	17,058	24,024	57	62	112	137
Agriculture	343	680	2,382	1,516	1,378	1,700	1,928	1,850	25	40	124	82
Forestry	60	114	445	357	222	260	444	411	27	44	100	87
Fishing		42	103	100		67	89	93		63	116	108
Mining	142	391	794	1,423	213	492	603	1,297	67	79	132	110
Manufacturing	966	2,220	5,474	8,496	1,371	3,295	4,829	6,402	70	67	113	133
Construction	205	263	921	1,797	499	604	1,050	1,598	41	44	88	112
Electricity, gas and water			490	1,120			355	828			138	135
Transportation and communication	569	902	2,860	2,996	717	1,154	1,408	2,143	79	78	203	140
Trade	625	868	2,972	4,637	1,073	1,411	2,343	3,428	58	62	127	135
Finance	514	574	1,497	3,474	936	873	1,540	2,383	55	66	97	146
Service	886	1,370	2,967	6,921	1,193	2,187	2,465	3,590	74	63	120	193
Government	225	644	995	2,529	232	1,109	827	1,278	97	58	120	198
All Other Services	661	726	1,972	4,392	961	1,078	1,638	2,312	69	67	120	190

TABLE B-2
PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC PRODUCT AT FACTOR COST, BY INDUSTRY, 1931-1961

	(In Current Dollars)			
	1931	1941	1951	1961
All Industries	100.0	100.0	100.0	100.0
Agriculture	8.0	9.2	12.5	4.6
Forestry	.9	1.5	2.3	1.1
Fishing	.5	.6	.5	.3
Mining	3.3	5.3	4.2	4.3
Manufacturing	22.4	29.9	28.6	25.9
Construction	4.8	3.5	4.8	5.5
Electricity, gas and water			2.3	3.4
Transportation and communication	13.2	12.1	9.0	9.1
Trade	14.5	11.7	12.5	14.1
Finance ⁽¹⁾	11.9	7.7	7.8	10.6
Service				
Government ⁽²⁾	5.2	8.7	5.2	7.7
Other Services	15.3	9.8	10.3	13.4

SOURCE: Dominion Bureau of Statistics, National Account Income and Expenditure: 1926-56, pp. 28-29; 1961, p. 17.

(1) includes ownership of dwellings.

(2) includes defence.

Appendix C

Additional Tables on the Impact of Changes in the Three Variables on the Occupational Composition of the Labour Force

The method of measuring the impact on occupational composition of changes in the three variables was outlined in Section 3 of Chapter 7. The output and productivity figures for each year are shown in Chapter 7 (Tables 22 and 24 respectively). The occupational structure figures are presented in Table 25 of Chapter 7, rounded to the nearest whole percent. The actual figures used in the calculations, which were taken to one decimal place, were derived from the industry by occupation matrices shown in Appendix A.

Range of the Results of the Calculations Using the Six Different Approaches

Table C-1 shows the results of the calculations using the six different approaches. Data are presented for the 1931-1961 period only, however the consistency is the same for each decade as well.

Sources of Change in the Number of Persons in the Labour Force in Each Occupation, 1931-1961

Tables C-2 and C-3 show the overall and decade-by-decade impact of the changes in each variable on the numerical distribution of the labour force by occupation.

TABLE C-1
CALCULATIONS OF IMPACTS OF THE THREE VARIABLES
SHOWING THE SIX APPROACHES,
1931-1961

Occupation		Factors					Factors		
		Q	P	S			Q	P	S
Managerial	1.	.9	1.0	.6	Labourers	1.	3.5	-1.3	-7.9
	2.	.9	.8	.8		2.	3.5	-0.4	-8.9
	3.	.9	.8	.8		3.	1.3	-0.4	-6.6
	4.	.7	1.2	.6		4.	2.7	-0.5	-7.9
	5.	.6	1.2	.7		5.	1.0	-0.5	-6.2
	6.	.6	1.1	.8		6.	1.0	-0.1	-6.6
Average		.8	1.0	.7	Average		2.2	-0.5	-7.4
Clerical	1.	1.4	1.5	3.7	Service	1.	-1.2	1.8	1.3
	2.	1.4	1.6	3.6		2.	-1.2	2.4	.7
	3.	2.1	1.6	2.9		3.	-.9	2.4	.5
	4.	.9	1.9	3.7		4.	-1.4	2.0	1.3
	5.	1.5	1.9	3.2		5.	-1.3	2.0	1.1
	6.	1.5	2.2	2.9		6.	-1.3	2.7	.5
Average		1.5	1.8	3.3	Average		-1.2	2.2	0.9
Manufacturing and Construction	1.	6.3	-3.6	3.4	Agricultural	1.	-14.0	-4.3	-0.0
	2.	6.3	-3.3	3.1		2.	-14.0	-4.2	-0.2
	3.	6.5	-3.3	2.9		3.	-13.7	-4.2	-0.4
	4.	4.7	-2.1	3.4		4.	-9.8	-8.5	-0.0
	5.	4.9	-2.1	3.2		5.	-9.7	-8.5	-0.2
	6.	4.9	-1.8	2.9		6.	-9.7	-8.2	-0.4
Average		5.6	-2.7	3.1	Average		-11.8	-6.3	-0.2
Transportation and Communication	1.	1.1	-.4	1.1	Mining	1.	1.0	-.9	-.5
	2.	1.1	-.9	1.5		2.	1.0	-.6	-.8
	3.	1.6	-.9	1.0		3.	.6	-.6	-.5
	4.	1.0	-.3	1.1		4.	.6	-.5	-.5
	5.	1.2	-.3	.8		5.	.4	-.5	-.3
	6.	1.2	-.5	1.0		6.	.4	-.3	-.5
Average		1.2	-.5	1.1	Average		.7	-.6	-.5
Professional	1.	.4	4.4	-.7	Forestry and Fishing	1.	-.5	.3	-.2
	2.	.4	3.1	.6		2.	-.5	.2	-.2
	3.	1.0	3.1	.1		3.	-.3	.2	-.3
	4.	.3	4.6	-.7		4.	-.6	.4	-.2
	5.	.8	4.6	-1.1		5.	-.4	.4	-.4
	6.	.8	3.3	.1		6.	-.4	.3	-.3
Average		.6	3.8	-.3	Average		-.5	.3	-.3
Commercial and Financial	1.	1.0	1.6	-0.8					
	2.	1.0	1.2	-0.3					
	3.	1.1	1.2	-0.4					
	4.	.9	1.7	-0.8					
	5.	.9	1.7	-0.8					
	6.	.9	1.3	-0.4					
Average		1.0	1.5	-0.6					

TABLE C-2
SOURCES OF CHANGE IN NUMBER OF PERSONS IN LABOUR FORCE IN EACH OCCUPATION
COMPARING 1931 AND 1961
(Thousands)

	Numerical Distribution		Net Change		Amount of Net Change Arising from Change in					
					Output in Each Industry		Output per Man in Each Industry		Occupational Structure in Each Industry	
	1931	1961	Numerical	Total of Percentage	No.	% of Change	No.	% of Change	No.	% of Change
All Occupations	3917	6211	2294	100	5158	225	-2865	-125	0	0
Managerial	220	504	284	100	395	139	-152	-53	41	14
Professional	238	638	400	100	439	110	-34	-8	-6	-2
Clerical	261	825	564	100	577	102	-203	-36	190	34
Commercial and financial	240	495	255	100	417	164	-132	-52	-30	-12
Manufacturing and construction	636	1383	747	100	1349	181	-776	-104	173	23
Labourers	442	346	-96	-100	614	641	-281	-294	-428	-447
Transportation and communication	246	500	254	100	443	174	-253	-100	65	25
Service	360	688	328	100	434	132	-156	-48	50	15
Agricultural	1127	650	-477	-100	291	61	-760	-159	-9	-2
Logging and fishing	90	118	28	100	82	293	-40	-145	-13	-48
Mining	57	65	8	100	117	1453	-78	-964	-31	-388

TABLE C-3
SOURCES OF INTERDECADE CHANGES IN NUMBER OF PERSONS IN EACH OCCUPATION,
CANADA, 1931-1961
(Thousands)

	Interdecade Changes in Number of Persons in Each Occupation				Amount of Each Decade's Net Change Arising from Change in						Occupation Structure of Each Industry			
					Level of Output in Each Industry		Output per Man in Each Industry		Output per Man in Each Industry					
	1931 to 1961	1931 to 1941	1941 to 1951	1951 to 1961	1931 to 1941	1941 to 1951	1931 to 1941	1941 to 1951	1931 to 1941	1941 to 1951	1931 to 1941	1941 to 1951	1931 to 1941	1941 to 1951
All Occupations	2294	272	969	1054	5158	1210	1605	2017	-2865	-938	-637	-960	0	0
Managerial	284	6	167	111	395	59	138	175	-152	-30	-32	-58	41	-23
Professional	400	44	104	252	439	42	134	239	-34	-17	6	-4	6	19
Clerical	564	43	260	261	577	76	200	283	-203	-49	-31	-75	190	16
Commercial and financial	255	8	102	146	417	59	140	166	-132	-23	-21	-58	-30	-28
Manufacturing and construction	747	235	330	181	1349	403	383	533	-776	-333	-15	-321	173	165
Labourers	-96	-175	85	-6	614	156	122	154	-281	-131	-6	-82	-428	-200
Transportation and communication	254	21	147	86	443	82	123	209	-253	-86	7	-130	65	25
Service	328	80	7	241	434	54	183	186	-156	-9	-151	32	50	35
Agriculture	-477	-44	-253	-181	291	217	114	1	-760	-258	-365	-178	-9	-3
Logging	28	40	25	-37	82	25	60	14	-40	17	-29	-40	-13	-2
Mining	8	13	-5	0	37	37	8	57	-78	-21	0	-46	-31	-3

Appendix D

Wage Earners by Occupation Group Showing Mean
and Median Earnings For 1941 and Median Earnings for 1951

	Average Annual Earnings (current dollars)			Earnings in Each Occupation as a Percentage of Total Average		
	Mean	Median		Mean	Median	
	1941	1941	1951	1941	1941	1951
All Occupations	867	733	1,860	100	100	100
Managerial	2,421	1,986	3,491	279	271	188
Professional	1,293	1,045	2,329	149	144	125
Clerical	922	862	1,771	106	118	95
Commercial and financial	985	815	1,730	114	111	93
Manufacturing and construction	931	881	2,131	107	120	115
Labourers	597	555	1,516	69	76	82
Transportation and communication	1,009	935	2,065	116	128	111
Service	456	350	1,054	53	48	57
Agriculture	298	271	769	34	37	41
Logging	476	383	1,173	55	52	63
Fishing	407	345	860	47	47	46
Mining	1,116	1,149	2,399	129	157	129

SOURCE: 1941 Census, Volume VI, Table 6.
1951 Census, Volume V, Table 21.

FOOTNOTES

- (1) The results of the earlier research appeared in a paper I presented to the 33rd Annual Meeting of the Canadian Political Science Association, Montreal, 1961, "Factors Determining Occupational Trends in the Canadian Economy", (mimeographed).
- (2) Dominion Bureau of Statistics:
Seventh Census of Canada, 1931, Vol. VII
Eighth Census of Canada, 1941, Vol. VII
Ninth Census of Canada, 1951, Vol. IV
- (3) Dominion Bureau of Statistics:
Seventh Census of Canada, 1931, Vol. VI
Eighth Census of Canada, 1941, Vol. VI
Ninth Census of Canada, 1951, Vol. V
- (4) Special Surveys Division, D.B.S., The Labour Force, December, 1961. This bulletin also contains estimates of employment in various industries. The unemployment rates were used because of the significant differences between the labour force estimates derived from the census and those derived from the monthly labour force survey. For example, the labour force total obtained from the census, 6,342,300, was 250,000 less than the estimate prepared by the monthly labour force survey for the same month. As a result of this discrepancy, the employment estimates for most industries based on the labour force survey exceed the census figures for the labour force in the industries.
- (5) Dominion Bureau of Statistics; Canadian Statistical Review:
Volume XXVII, Number 8, August 1952
Volume XXXVII, Number 12, December 1962
1955 Supplement
- (6) Department of Labour, Ottawa, Canada, Research Program on the Training of Skilled Manpower, Report No. 11, September, 1963.
- (7) Dominion Bureau of Statistics, Ottawa, 1948.
- (8) Indexes, Appendix B, p. 119.
- (9) Indexes for manufacturing (excluding repair), mining (excluding contract drilling) and electric power and gas were available back to 1919.
- (10) Wm. C. Hood and Anthony Scott, Output, Labour and Capital in the Canadian Economy, Royal Commission on Canada's Economic Prospects, Ottawa, 1957. (Output)
- (11) There was no own-account construction for agriculture in 1949 while the figure for transportation amounted to \$136.5 million or a little more than 10 percent of the Gross Domestic Product total of \$1195.8 million for the industry.
The non-residential rent figures for 1949 were small for both industries (\$50.2 million for agriculture and \$6.6 million for transportation).
- (12) The Inter-Industry Flow of Goods and Services, Canada, 1949, Dominion Bureau of Statistics, 1956.

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